GE Healthcare

Getting Started with

ImageQuant™ LAS 4000

Original instructions

Table of Contents

1 Introduction 5
1.1 Important user information 5
1.2 Regulatory information 7
1.3 The ImageQuant LAS 4000 8
1.4 ImageQuant LAS 4000 Control Software 10

2 Safety instructions 12
2.1 Safety precautions 12
2.2 Labels 18
2.3 Emergency procedure 24
2.4 Recycling information 24

3 Installation 26
3.1 Site requirements 26
3.2 Transport 26
3.3 Unpacking 26
3.4 Installation of the software 27
3.4.1 Installation (Windows XP) 27
3.4.2 Installation (Windows Vista) 30
3.5 Installation of hardware 33
3.5.1 Attaching the camera head 34
3.5.2 Connecting the camera head to the computer 35
3.5.3 Installing the lens 35
3.5.4 Attaching a filter to the filter changer 37
3.5.5 Installing a transmitted light source 39
3.5.6 Installing Epi light sources 40

4 Operation 42
4.1 Operation overview 42
4.2 Preparation 42
4.2.1 Starting the ImageQuant LAS 4000 and Control Software 42
4.2.2 Preparing the ImageQuant LAS 4000 for exposure 43
4.2.3 Placing the sample 49
4.3 Performing an exposure 52
4.3.1 Workflow 52
4.3.2 Choose method and tray position 53
4.3.3 Focus adjustment 55
4.3.4 Set exposure type and exposure time 55
4.3.5 Set exposure sensitivity 56
4.3.6 Exposure 57
4.3.7 Save the image 58
4.4 After exposure 59

5 Maintenance 61
5.1 ImageQuant LAS 4000 61

5.2 Sample trays 61
5.3 Lens, filters, NP tray and Epi light sources 62
5.4 UV transilluminator and white light table 62
5.5 Regular inspections 62

6 Troubleshooting 64
6.1 Problems with the exposed image 65
6.2 Strange sounds or odors are perceived 66
6.3 Problems with ImageQuant LAS 4000 67
6.4 Problems with ImageQuant LAS 4000 Control Software 68
6.5 Message “ImageQuant LAS 4000 hardware error occurred" 69
6.6 Error messages and countermeasures 71

7 Reference information 79
7.1 Main specifications 79
7.2 Minimum computer requirements 84
7.3 Literature 84
7.4 Ordering information 84

1 Introduction

Purpose of this manual

Getting Started with ImageQuant LAS 4000 provides instructions needed to handle the ImageQuant LAS 4000 in a safe way. Basic operating instructions are also provided. For details, refer to the ImageQuant LAS 4000 User Manual.

Prerequisites

In order to operate the ImageQuant LAS 4000 in the way it is intended, the following prerequisites must be fulfilled:

- You should have a general understanding of how a PC and Windows™ work.
- You must read the safety instructions outlined in the user documentation.
- You should be acquainted with the use of general laboratory equipment and with handling of biological materials.

In this chapter

This chapter contains important user information, a general description of the ImageQuant LAS 4000 and its intended use.

1.1 Important user information

Read this before using the ImageQuant LAS 4000

All users must read the safety instructions in the ImageQuant LAS 4000 user documentation before installing, using or maintaining the equipment.

Do not operate the ImageQuant LAS 4000 in any other way than described in the user documentation. Otherwise, you may be exposed to hazards that can lead to personal injury and you may cause damage to the equipment.

Intended use

The ImageQuant LAS 4000 is a camera system that produces digital images of chemiluminescent, dyed or fluorescent gels and membranes. The ImageQuant LAS 4000 is intended for research use only, and shall not be used in any clinical procedures, or for diagnostic purposes.

Safety notices

This user documentation contains WARNINGS, CAUTIONS and NOTICES concerning the safe use of the product. See definitions below.

Warnings

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.

Cautions

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.

Notices

NOTICE

NOTICE indicates instructions that must be followed to avoid damage to the product or other equipment.

Notes and tips

Note: *A Note is used to indicate information that is important for trouble-free and optimal use of the product.*

TIP: A tip contains useful information that can improve or optimize your procedures.

Typographical conventions

Software items are identified in the text by ***bold italic*** text. A colon separates menu levels, thus ***File:Open*** refers to the ***Open*** command in the ***File*** menu. Hardware items are identified in the text by **bold** text (e.g., **Power** switch).

1.2 Regulatory information

This section describes the directives and standards that are fulfilled by the ImageQuant LAS 4000.

Manufacturing information

The Declaration of Conformity includes the following information:

Requirement	Content
Name and address of manufacturer	GE Healthcare Bio-Sciences AB Björkgatan 30, SE-751 84 Uppsala, Sweden
Name and ID of notified body	INTERTEK SEMKO AB, NB 0413
Place and date of declaration	Uppsala, Sweden, May 2009
Identity of person authorized to sign Declaration of Conformity	See EC Declaration of Conformity

CE Conformity

This product complies with the European directives listed in the table, by fulfilling the corresponding harmonized standards. A copy of the Declaration of Conformity is available on request.

Directive	Title
2006/42/EC	Machinery Directive (MD)
2006/95/EC	Low Voltage Directive (LVD)
2004/108/EC	ElectroMagnetic Compatibility (EMC) Directive

International standards

This product fulfills the requirements of the following standards:

Standard	Description	Notes
EN 61010-1, IEC 61010-1, UL 61010-1, IEC 61010-2-81, CAN/CSA-C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use	
EN 61326-1 VCCI Class A FCC Part 15 B Class A ICES-003 Class A	EMC emissions and immunity requirements for electrical equipment for measurement, control and laboratory use	Harmonized with 2004/108/EC
EN-ISO 12100-1, 12100-2	Safety of machinery - Basic concepts, general principles for design	Harmonized with 2006/42/EC

Standard	Description	Notes
EN-ISO 14121-1, 14121-2	Safety of machinery - Principles of risk assessment	Harmonized with 2006/42/EC

CE Marking

The CE marking and the corresponding Declaration of Conformity is valid for the instrument when it is:

- used as a stand-alone unit, or
- connected to other CE marked GE Healthcare instruments, or
- connected to other products recommended or described in the user documentation, and
- used in the same state as it was delivered from GE Healthcare, except for alterations described in the user documentation.

Regulatory compliance of connected equipment

Any equipment connected to the ProductNameHW should meet the safety requirements of EN 61010-1/IEC 61010-1, or relevant harmonized standards. Within EU, connected equipment must be CE marked.

1.3 The ImageQuant LAS 4000

Feature overview

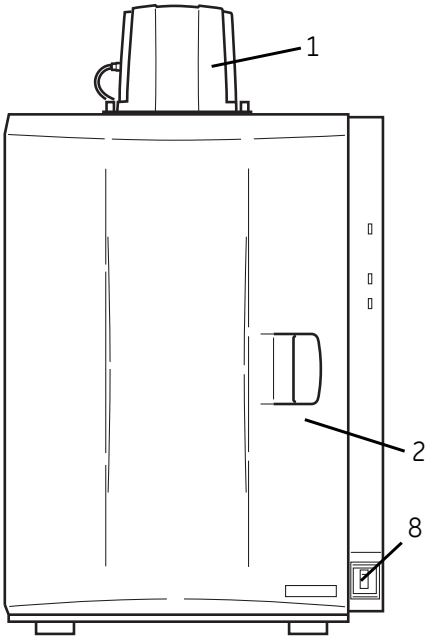
The following features are offered by the ImageQuant LAS 4000:

- Digitized images of stained gels, membranes or films can be obtained by white light illumination.
- A super CCD camera of 3.2 megapixels is used. An effective resolution of 6.3 megapixels can be obtained by the image processing procedure.
- Internal cooling of the CCD contributes to a low thermal noise level resulting in greater sensitivity.
- The F0.85 LAS High Sens. lens has remote focus and iris.
- Chemiluminescence is detected at high sensitivity using a four-step binning algorithm.
- Fluorescence is detected at high sensitivity using either a UV transilluminator or one of several Epi light sources.

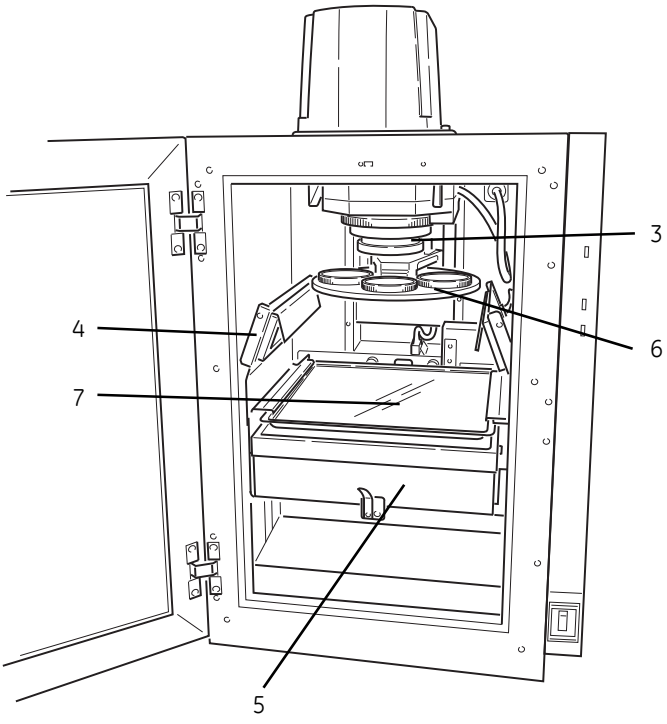
- Image capture and analysis is simplified using the ImageQuant LAS 4000 Control Software in combination with GE Healthcare's analysis software, ImageQuant TL.

ImageQuant LAS 4000 hardware components

The following illustrations and table show the main hardware components of the ImageQuant LAS 4000.



Intelligent dark box (IDX)



IDX interior

Part	Name	Description
1	Camera head	CCD cooling and image data output
2	Intelligent dark box (IDX)	Dark box
3	Lens	F0.85/43 mm LAS High Sens. lens, or F1.8/24 mm wide view lens
4	Epi light source	NIR Epi light (710 nm) Red Epi light (630 nm) Green Epi light (520 nm) Blue Epi light (460 nm) UV Epi light (365 nm) White Epi light

Part	Name	Description
5	Trans light source	312 nm UV transilluminator White light table
6	Filter	IR785 Alexa (filter for NIR LED) R670 Cy5 (filter for red LED) 575DF20 Cy3 (filter for green LED) 605DF40 EtBr (filter for detecting EtBr) 510DF10 (filter for detecting GFP) Y515 (filter for blue LED) L41 UV (filter for UV LED)
7	Sample tray	Epi tray (for chemiluminescence and Epi lights) White trans tray (for white light table) UV trans tray (for UV transilluminator) NP tray (for titer plates)
8	Power switch	Turn the ImageQuant LAS 4000 on or off

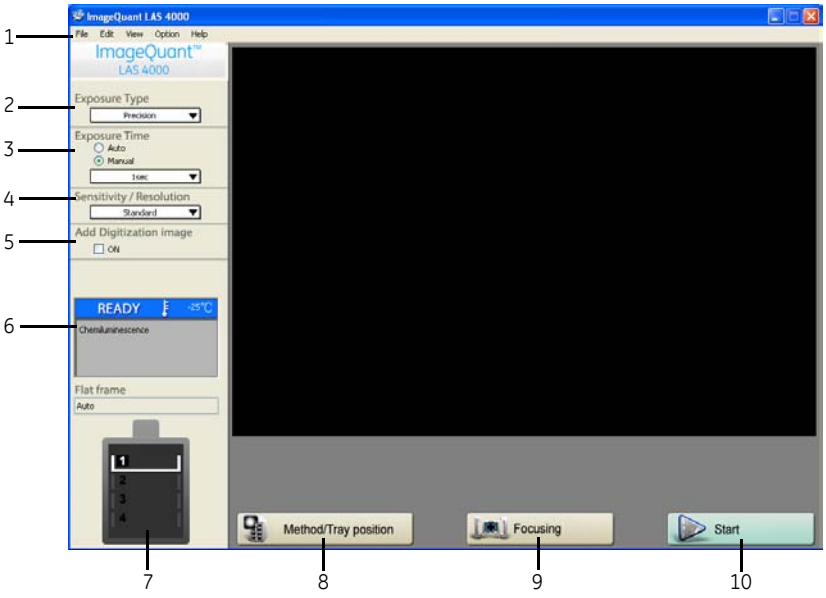
Computer

The ImageQuant LAS 4000 is operated using a PC running Windows XP or VISTA. It is not designed for standalone operation.

Note: *The computer used should be certified according to IEC/UL 60950.*

1.4 ImageQuant LAS 4000 Control Software

Exposure and exposure settings are controlled by the ImageQuant LAS 4000 Control Software. The software user interface is described below.



Part	Name	Description
1	Menu bar	Access to program functions
2	***Exposure Type***	Set the exposure method
3	***Exposure Time***	Set the exposure time
4	***Sensitivity/Resolution***	Set the sensitivity and resolution
5	***Add Digitization Image***	Add a white light exposure to a chemiluminescent exposure (used for overlaying a marker image)
6	Setting state, CCD	The state of the CCD and exposure type
7	Setting state, IDX	Current settings of tray position and illumination inside the dark box
8	***Method/Tray position***	Set the detection method and tray position
9	***Focusing***	Adjust the focus
10	***Start***	Start the exposure

2 Safety instructions

This chapter describes safety precautions, safety labels and emergency procedures for the ImageQuant LAS 4000, in addition to information on the safe disposal of the instrument.

2.1 Safety precautions

Introduction

The ImageQuant LAS 4000 is powered by mains voltage and is used to image samples that may be hazardous. Before installing, operating or maintaining the equipment, you must be aware of the hazards described in the user documentation. Follow the instructions provided to avoid personal injury or damage to the equipment.

General precautions

WARNING

Do not use the equipment if smoke, strange noises or strange odors can be perceived, or if the equipment becomes unusually hot. This may result in fire or electric shock.

Stop using immediately, turn off the power switch and unplug the equipment from the power outlet. Contact your local GE Healthcare representative to request repair.

WARNING

Do not allow liquids, flammable materials or metallic objects to get into the camera head or the ImageQuant LAS 4000. This may result in fire or electric shock.

Turn off the power switch, unplug the equipment from the power outlet, then contact you local GE Healthcare representative.

WARNING

Do not drop or otherwise damage the camera head or ImageQuant LAS 4000. This may result in fire or electric shock.

Turn off the power switch, unplug the equipment from the power outlet, then contact you local GE Healthcare representative.

WARNING

Do not damage the power supply cord by bending, twisting, heating or allowing them to become pinned under the equipment. Using damaged power cords could result in fire or electric shock.

If the power supply cords are damaged, contact your local GE Healthcare representative for replacements.

WARNING

Do not place the equipment on unstable tables or on inclined surfaces, as the equipment could be dropped or fall, resulting in injury.

CAUTION

Do not place the equipment or parts in direct sunlight. This may degrade performance or result in overheating and fire.

CAUTION

Do not scratch or drop parts containing glass such as lenses, filters or lights.

Personal protection

WARNING

Parts of this equipment emit UV radiation. Avoid exposure. Wear protective clothing and eyewear. UV radiation can cause severe burns and long-term injury to the skin and eyes.

Excessive exposure of the skin can cause premature aging, allergic reactions and cancer. Medication or cosmetics may increase sensitivity to UV radiation. Consult a physician before using this product if using medication, if you have known skin disorders or if you are especially sensitive to sunlight.

Excessive exposure of the eyes can result in permanent damage to your vision.

CAUTION

Do not stare at the light emitted from the LED lights sources. This may impair vision.

Operation

WARNING

Do not use the equipment with a power supply other than that recommended. Fire and electric shock could result.

WARNING

Do not use the equipment within or near a sink, or in humid or dusty environments. Fire and electric shock could result.

WARNING

If thunder can be heard, do not touch the power supply plug, or electric shock could result.

WARNING

Connect the power supply directly to a grounded wall power outlet. The use of extension cords or multiple loads on one electrical outlet could result in fire and electric shock.

CAUTION

Do not use the same power supply as that of large equipment such as an air conditioner or centrifuge. Malfunction could result.

CAUTION

Do not block the vents and ensure that the vents are kept free of dust and dirt. Blockage of the vents can result in overheating of the equipment and malfunction. Place the instrument at least 20 cm away from walls or other equipment to ensure adequate cooling.

CAUTION

Do not open the door of the instrument too wide, and do not apply excessive force to it.

CAUTION

When opening or closing the door use the opening lever. Take care not to catch objects or fingers in the door when closing.

CAUTION

Do not place heavy objects on the equipment. These may fall and cause injury.

CAUTION

Only one ImageQuant LAS 4000 should be connected to a particular PC. Connecting more than one may result in malfunction.

CAUTION

Turn the power switch off before connecting or disconnecting cables, otherwise the equipment may malfunction.

CAUTION

Do not connect any lens or light source other than those recommended by GE Healthcare.

CAUTION

Turn the power switch off before attaching or detaching a lens, otherwise the equipment may malfunction.

CAUTION

Do not leave the lens hanging from the lens guide. It may fall and damage the equipment.

CAUTION

Do not touch the shutter on the camera head. Damage to the shutter will impede correct operation.

CAUTION

Do not repeatedly turn the power switch on and off unnecessarily. This may cause malfunction.

CAUTION

Do not leave samples in the equipment after exposure. If left, these may degrade and cause damage.

CAUTION

The Epi lights are in sets of two for the left and right sides. Ensure that they are correctly installed. Do not mix light sources of differing types.

CAUTION

Ensure that the Epi lights are connected and locked in position before turning the power on.

CAUTION

Keep the windows of the light sources clean and avoid touching them.

NOTICE

The UV trans tray will deteriorate with repeated UV radiation. This is normal. Replace the UV trans tray when this deterioration becomes noticable in exposed images.

NOTICE

Do not disconnect the USB cable while the Control Software is running.

Maintenance

WARNING

Do not remove the covers of the camera head or the ImageQuant LAS 4000. High temperature and high voltage parts could result in burns or electric shock.

Contact your local GE Healthcare representative to request internal inspection, servicing, and repairs.

WARNING

Do not attempt to modify the equipment, or fire and electric shock could result.

CAUTION

Take care when connecting the power supply cable. Do not tug on the cable, and do not handle the connection plugs with wet hands.

CAUTION

Connect the computer hardware on the same power circuit, otherwise the equipment may be influenced by electrical nosie.

CAUTION

Turn off the power switch and remove connecting cables before moving the equipment.

CAUTION

Turn the power switch off before cleaning the inside of the equipment.

CAUTION

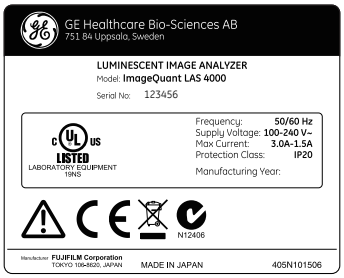
Unplug the equipment if it will not be used for an extended period.

2.2 Labels

On the exterior of the ImageQuant LAS 4000 there are a number of labels describing equipment specifications as well as precautions necessary to safely use the ImageQuant LAS 4000. This section lists the symbols used on the safety labels and shows the location of labels on each component. The names of parts on the components are also shown.

ImageQuant LAS 4000 serial number

The ImageQuant LAS 4000 serial number is located on a label on the back of the instrument.



Symbols used in safety labels

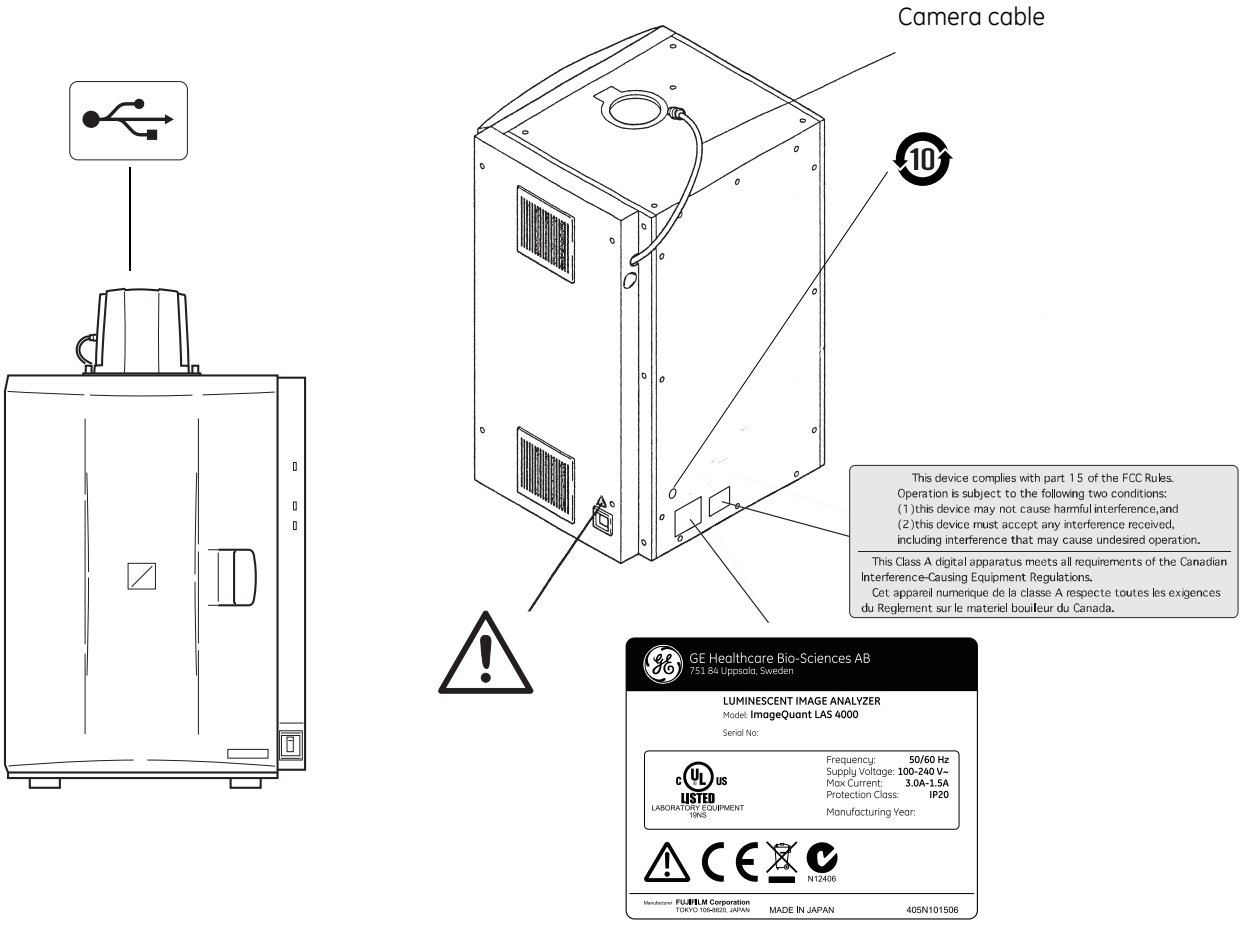
Label	Meaning
	Warning! Read the user documentation before using the system. Do not open any covers or replace parts unless specifically stated in the user documentation.
	The system complies with the requirements for electromagnetic compliance (EMC) in Australia and New Zealand.
	The system complies with applicable European directives.

Labels concerning use of hazardous substances

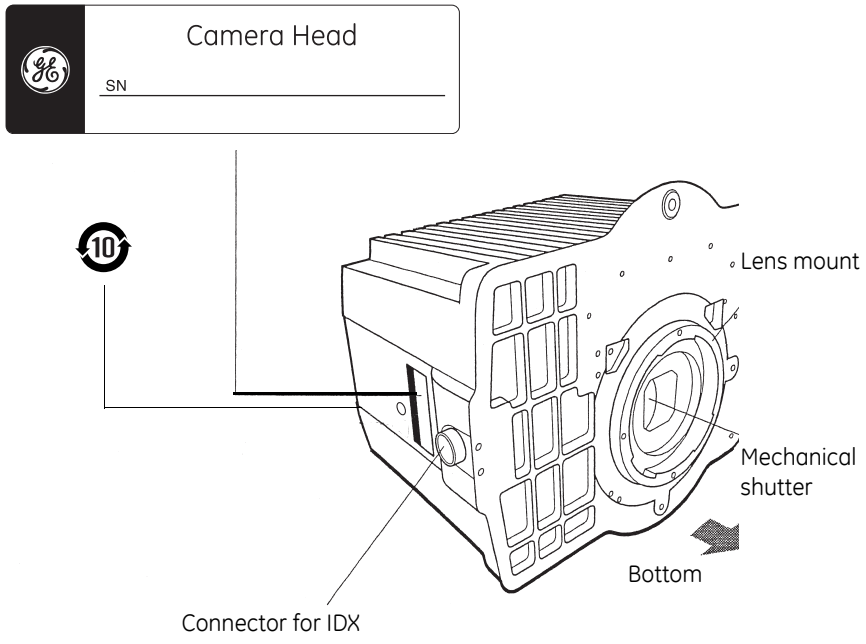
Label	Meaning
	This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.

Label	Meaning
	This symbol indicates that the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronics.

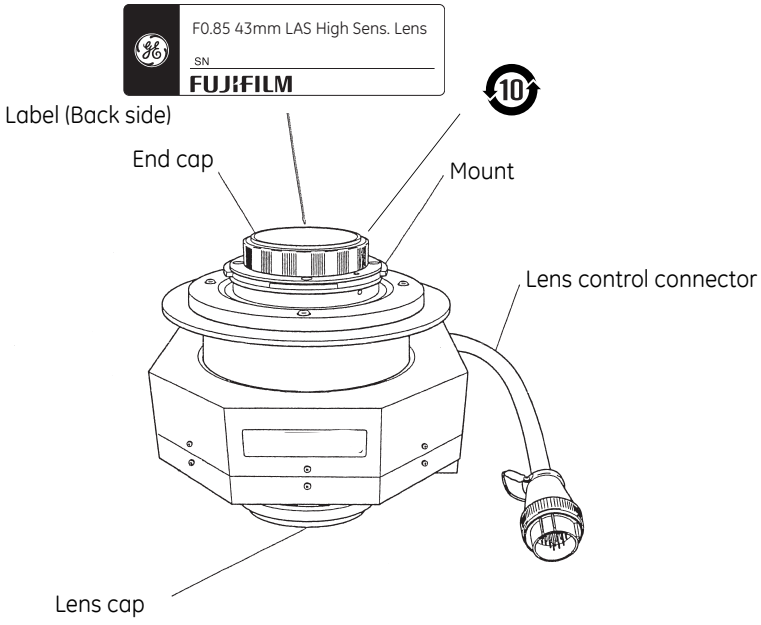
Intelligent dark box (IDX)



Camera head

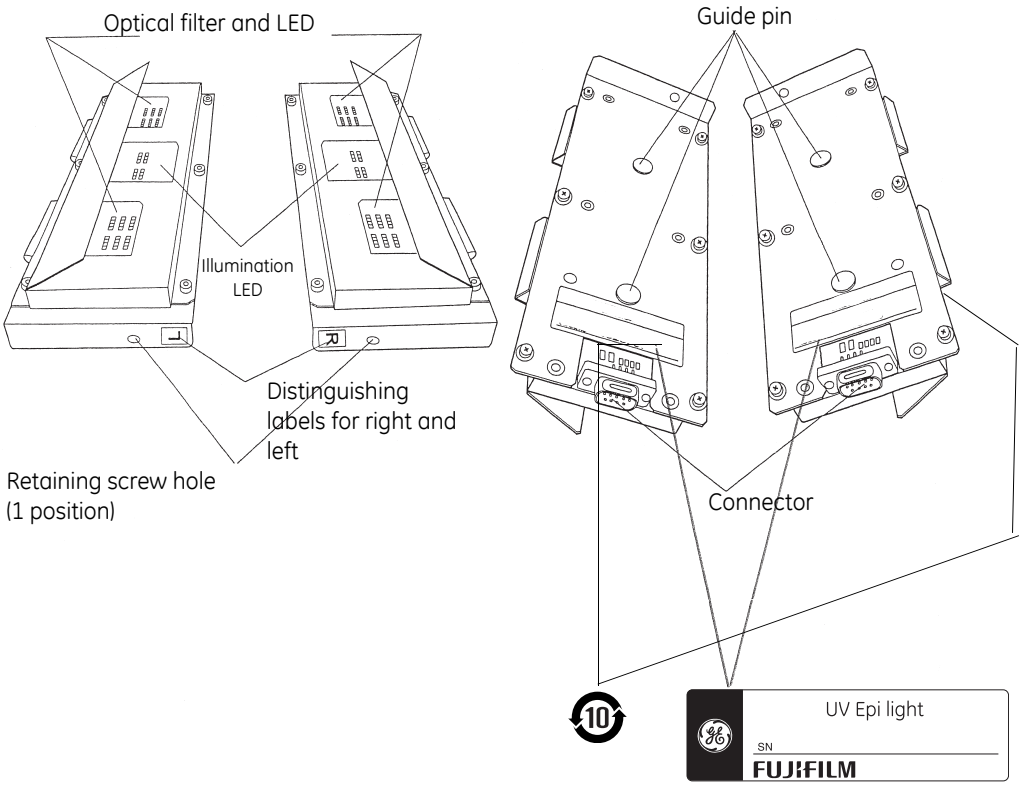


LAS High Sens. lens

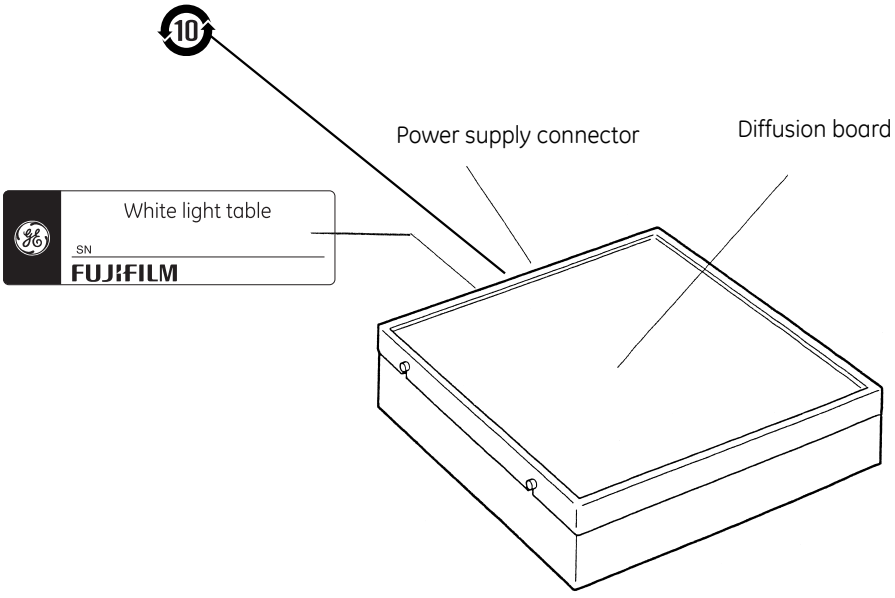


Epi lights

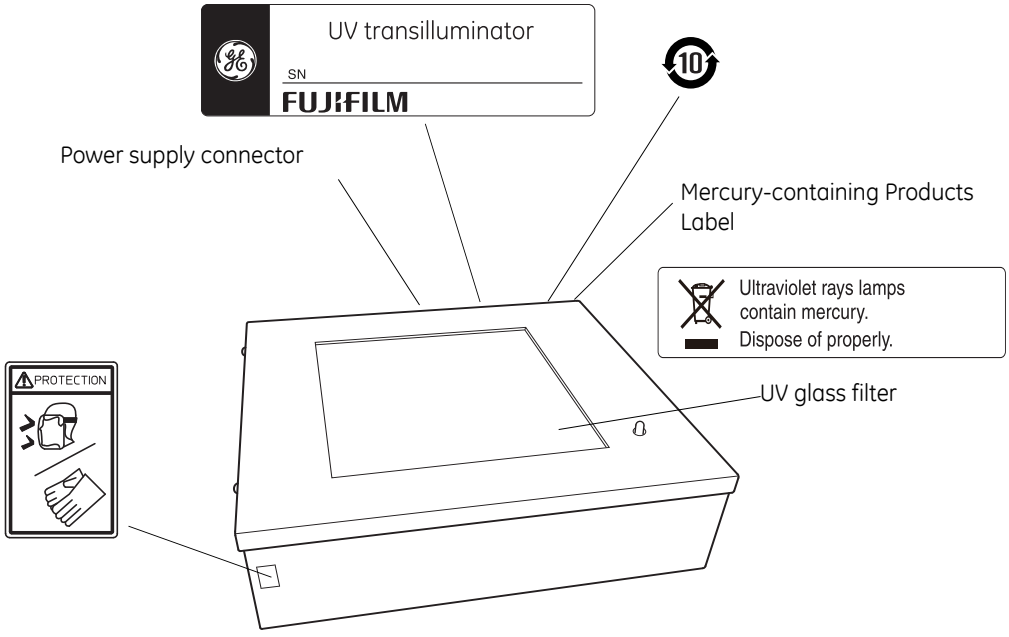
The following diagram shows the UV Epi lights. Other Epi light pairs are labelled corresponding to their type.



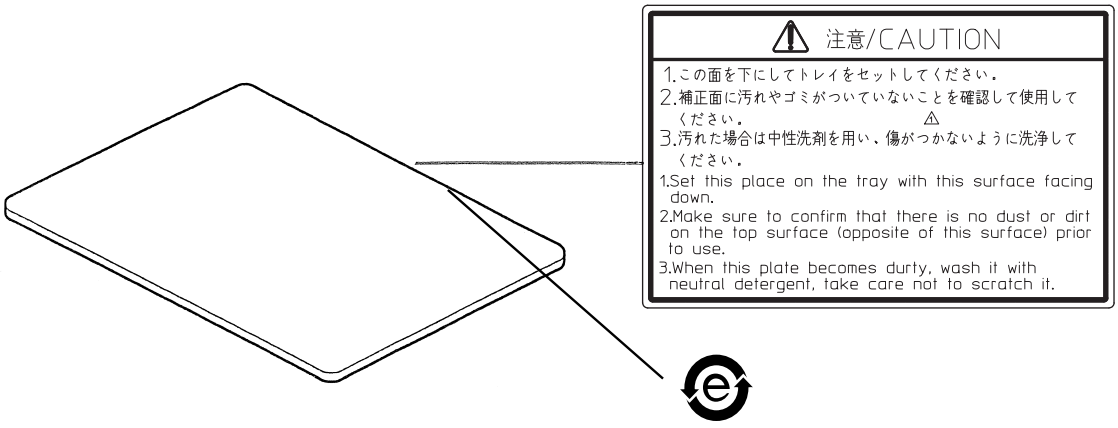
White light table



UV transilluminator

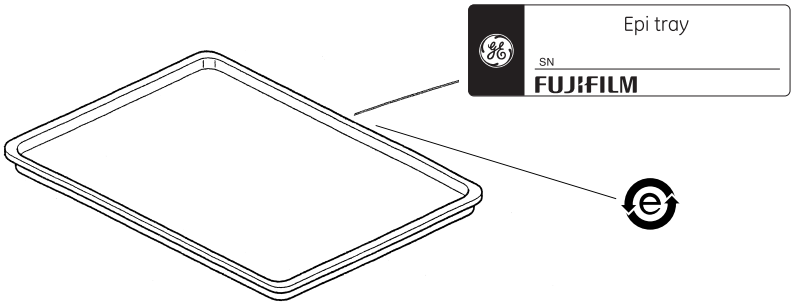


Cal plates



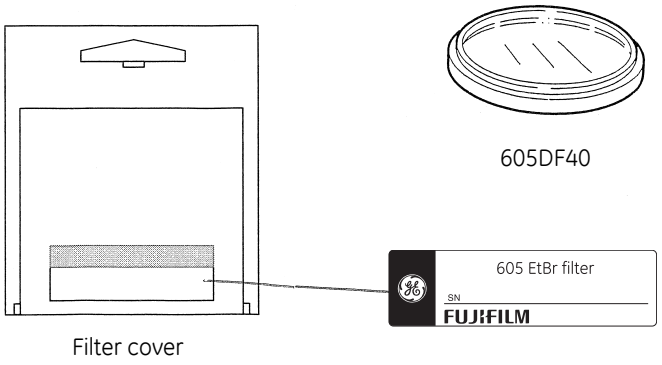
Sample trays

The Epi tray is shown here. The White trans tray and UV trans tray are labelled correspondingly.



Filters

The 605DF40 filter is shown here. Other filters are labelled according to their type.



2.3 Emergency procedure

In an emergency situation:

- Turn off the ImageQuant LAS 4000 power switch.
- Disconnect the power cable from the wall socket.

WARNING

Access to power switch and power cord. Do not block the rear and side panel of the instrument. The **Power** switch must always be easy to access. The power cord must always be easy to disconnect.

2.4 Recycling information

The equipment must be clean from contaminants before decommissioning and all local regulations must be observed with regard to waste disposal.

Disposal, general instructions

When taking the ImageQuant LAS 4000 out of service, the different materials must be separated and recycled according to national and local environmental regulations.

Recycling of hazardous substances

The lamps in the ImageQuant LAS 4000 may contain mercury vapour. These must be disposed of in manner compliant with local regulations.

Disposal of electrical components

Waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of the equipment.

3 Installation

This chapter provides information regarding installation of the ImageQuant LAS 4000.

3.1 Site requirements

The following table gives a summary of power supply and environmental requirements. For detailed information, refer to *Section 7.1 Main specifications, on page 79*.

Parameter	Requirement
Power supply	13 A, 100 - 120 V or 10 A, 200 - 240 V
Line frequency	50 to 60 Hz
Ambient temperature	15°C to 28°C, fluctuation < 10°C/h (Storage: -25°C to 70°C)
Placement	Stable laboratory bench, load capacity > 100kg/m^2 At least 20 cm free on all sides
Humidity	30% to 70%, non-condensing (Storage: 5% to 100%, non-condensing)

3.2 Transport

The ImageQuant LAS 4000 weighs approximately 57 kg and requires at least two people to lift and move it.

Before moving the instrument:

1 Turn off the instrument.

2 Disconnect the power cord.

3 Remove the lens, transmitted light source and any loose parts from inside of the IDX. Refer to the ImageQuant LAS 4000 User Manual.

3.3 Unpacking

When unpacking:

- Check the equipment for any apparent damage before installing.

- Document any damage carefully and contact your GE Healthcare representative.

3.4 Installation of the software

3.4.1 Installation (Windows XP)

Installation is performed in the following sequence.

1 Installation of USB Control driver

2 Installation of USB Function driver

3 Installation of ImageQuant LAS 4000

3.4.1.1 Installation of the USB Control Driver (Windows XP)

Note: *The computer and ImageQuant LAS 4000* ***must not*** *be connected with a USB cable during the operation.*

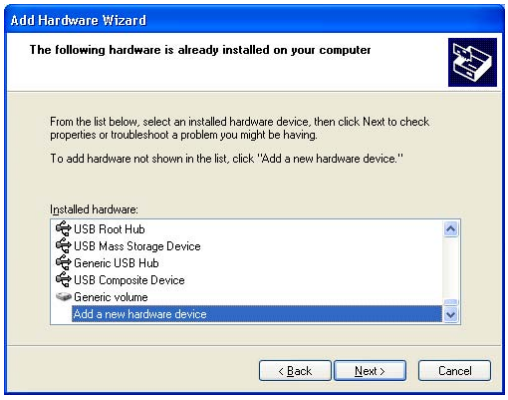
1 Open the control panel and select ***Printers and Other Hardware***.

2 Click ***Add Hardware***.

3 Click the ***Next*** button in the ***Add Hardware Wizard***.

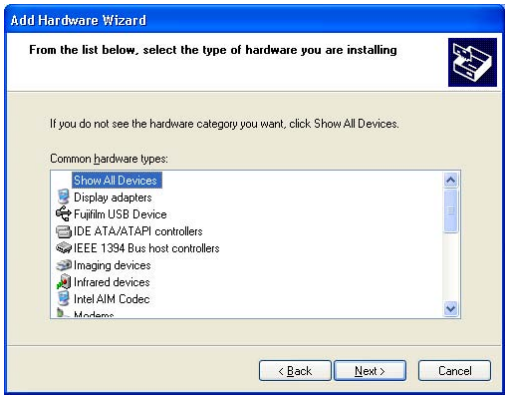
4 Select ***Yes, I have already connected the hardware*** and click the ***Next*** button.

5 Select ***Add a new hardware device*** and click the ***Next*** button.



6 Select ***Install the hardware that I manually select from a list [Advanced]*** and click the ***Next*** button.

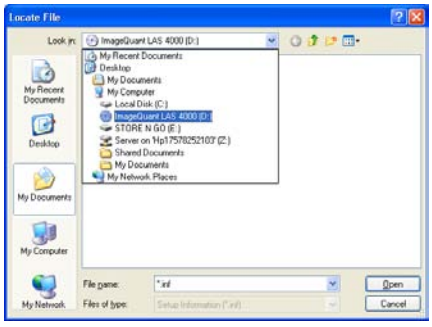
7 Select ***Show All Devices*** and click the ***Next*** button.



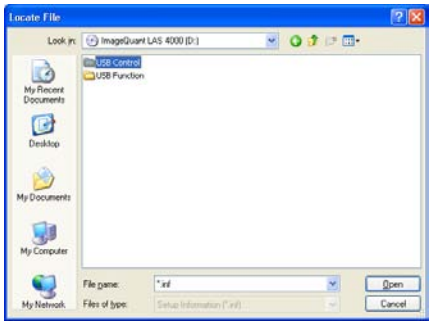
8 Click the ***Have Disk*** button.

9 Insert the ImageQuant LAS 4000 CD and click the ***Browse*** button.

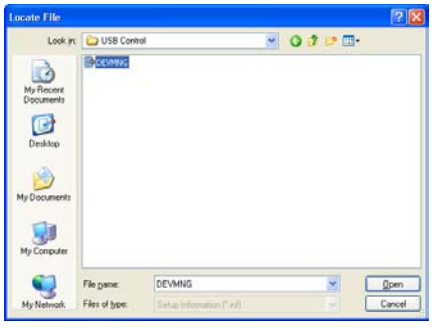
10 Select to install the driver from the ImageQuant LAS 4000 CD.



11 Open the ***USB Control*** folder.



12 Select the ***DevMng.inf*** file and click the ***Open*** button.



13 Click the ***OK*** button in the ***Install From Disk*** dialog.

14 Click the ***Next*** button in the ***Add Hardware Wizard***.

15 Click the ***Next*** button once again in the ***Add Hardware Wizard***.

16 Click the ***Continue Anyway*** button.

17 Click the ***Finish*** button to complete the driver installation.

3.4.1.2 Installation of the USB Function driver (Windows XP)

1 Connect the computer and the ImageQuant LAS 4000 with a USB cable and turn **ON** the power switch of ImageQuant LAS 4000.

*Result:*The ImageQuant LAS 4000 will automatically be detected by the computer.

2 In the ***Found New Hardware Wizard*** dialog, choose ***No, not this time*** and click the ***Next*** button.

3 Insert the ImageQuant LAS 4000 CD, then select ***Install the software automatically (Recommended)*** and click the ***Next*** button.

4 Click the ***Finish*** button to complete the installation.

3.4.1.3 Installation of ImageQuant LAS 4000 Control Software (Windows XP)

1 Insert the ImageQuant LAS 4000 Control Software CD.

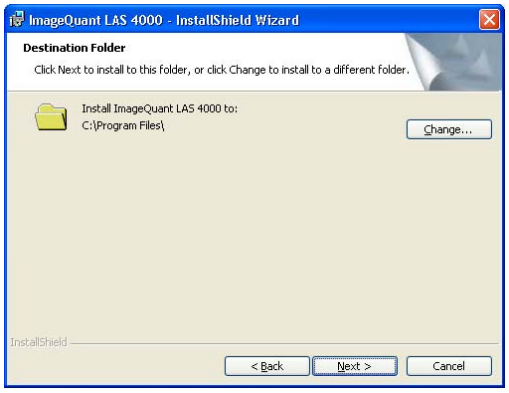
2 Locate and double-click the file ImageQuant LAS 4000.msi.

3 In the ***ImageQuant LAS 4000 - InstallShield Wizard***, click the ***Next*** button.

4 Read the license text. If the license agreement is not acceptable please contact a GE Healthcare representative, see the back cover of this manual for contact information.

Select ***I accept the terms in the license agreement*** and click the ***Next*** button.

5 Select destination folder in the dialog:



- Click the ***Next*** button to install the software at the default folder ***C:\Program Files***.
- Click the ***Change*** button to install to a different folder.

6 Click the ***Install*** button.

7 Click the ***Finish*** button.

The installation of ImageQuant LAS 4000 Control Software is now completed.

3.4.2 Installation (Windows Vista)

Installation is performed in the following sequence.

1 Installation of FUJI USB Control driver

2 Installation of FUJI USB Function driver

3 Installation of ImageQuant LAS 4000 Control Software

3.4.2.1 Installation of the USB Control Driver (Windows VISTA)

Note: *The computer and ImageQuant LAS 4000* ***must not*** *be connected with a USB cable during the operation.*

Note: *During software installations, you may be asked to confirm your actions in a dialog with the text* ***Windows needs your permission to continue****. Enter an administrator password, if prompted, then click* ***Continue*** *to proceed with the installation.*

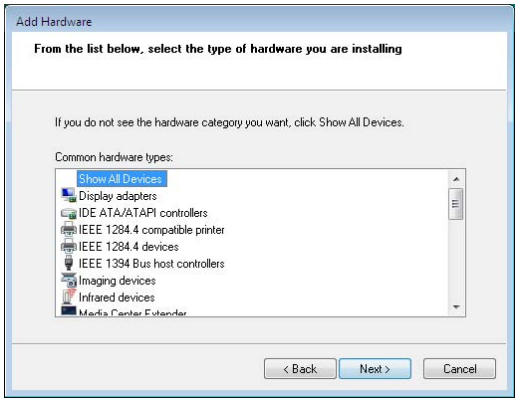
1 Open the control panel and click ***Classic View*** in the upper left corner.

2 Open the ***Add Hardware*** tool.

3 In the ***Add Hardware*** dialog, click the ***Next*** button.

4 Select ***Install the hardware that I manually select from a list (Advanced)*** and click the ***Next*** button.

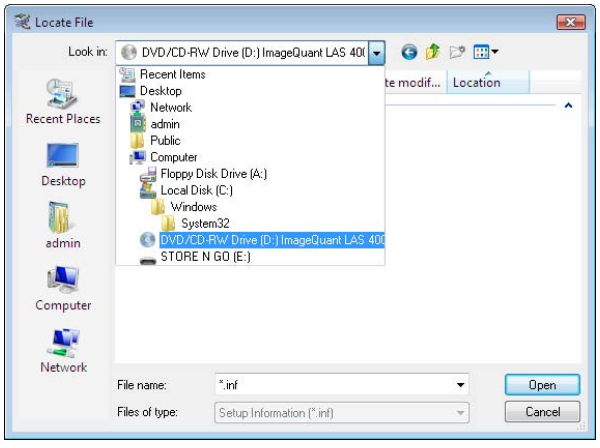
5 Select ***Show All Devices*** and click the ***Next*** button.



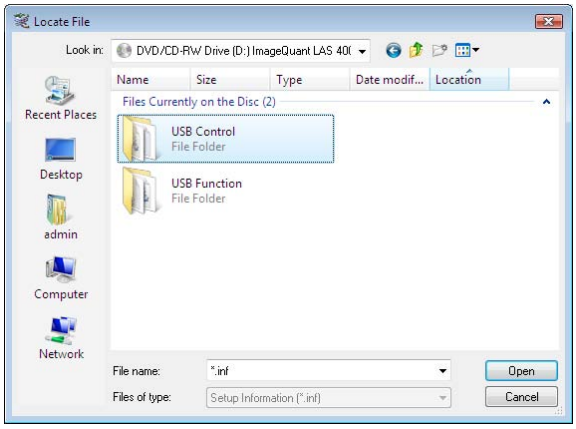
6 Click the ***Have Disk*** button.

7 Insert the ImageQuant LAS 4000 Control Software CD and click the ***Browse*** button.

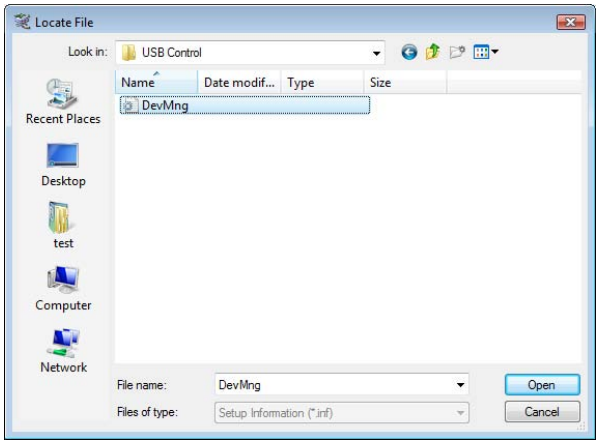
8 Select to install the driver from the ImageQuant LAS 4000 Control Software CD.



9 Open the ***USB Control*** folder.



10 Select the file ***DevMng*** and click the ***Open*** button.

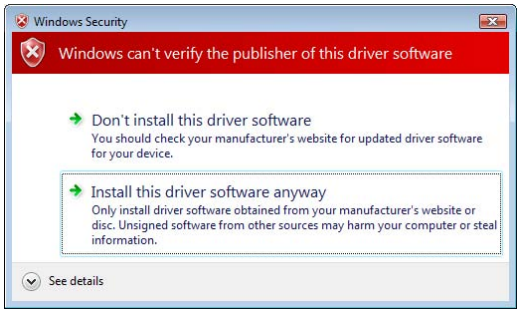


11 Click the ***OK*** button in the ***Install From Disk*** dialog.

12 Click the ***Next*** button in the ***Add Hardware*** dialog.

13 Click the ***Next*** button once more in the ***Add Hardware*** dialog.

14 Click ***Install this driver software anyway***.



15 Click the ***Finish*** button.

3.4.2.2 Installation of the USB Function driver (Windows VISTA)

Note: *During software installations, you may be asked to confirm your actions in a dialog with the text* ***Windows needs your permission to continue****. Enter an administrator password, if prompted, then click* ***Continue*** *to proceed with the installation.*

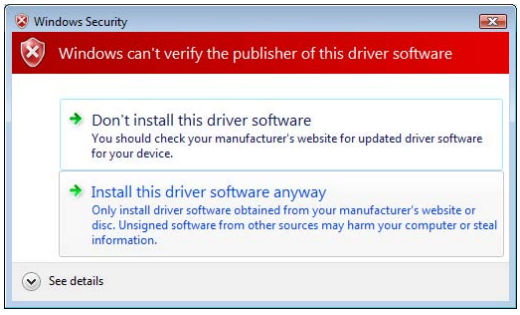
1 Connect the computer and the ImageQuant LAS 4000 with a USB cable and turn **ON** the power switch of ImageQuant LAS 4000.

Result: The ImageQuant LAS 4000 will automatically be detected by the computer and the Plug and Play function in Windows Vista starts.

2 In the ***Found New Hardware*** dialog, select ***Locate and install driver software (recommended)***.

3 Insert the ImageQuant LAS 4000 Control Software CD and click the ***Next*** button in the ***Found New Hardware*** dialog.

4 Select ***Install this driver software anyway***.



5 A successful installation message appears. Click the ***Close*** button.

3.4.2.3 Installation of ImageQuant LAS 4000 Control Software (Windows VISTA)

1 Insert the ImageQuant LAS 4000 Control Software CD.

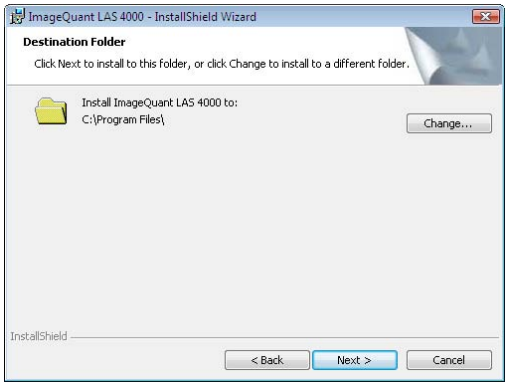
2 Locate and double-click the file ImageQuant LAS 4000.msi.

3 In the ***ImageQuant LAS 4000 - InstallShield Wizard*** dialog, click the ***Next*** button.

4 Read the license text. If the license agreement is not acceptable please contact a GE Healthcare representative, see the back cover of this manual for contact information.

Select ***I accept the terms in the license agreement*** and click the ***Next*** button.

5 Select destination folder in the dialog:



- Click the ***Next*** button to install the software at the default folder ***C:\Program Files***.
- Click the ***Change*** button to install to a different folder.

6 Click the ***Install*** button.

7 If User Account Control (UAC) is enabled in Windows Vista, a dialog displays the message ***An unidentified programs wants access to your computer***. Click ***Allow***.

8 Click the ***Finish*** button.

The installation of ImageQuant LAS 4000 Control Software is now completed.

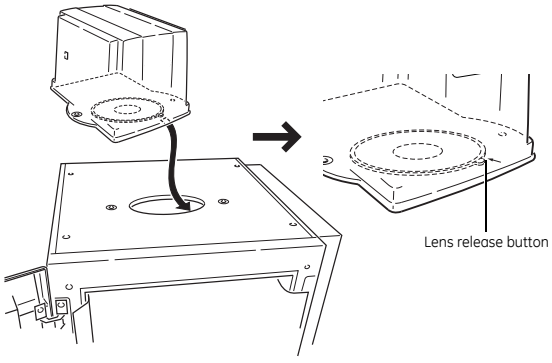
3.5 Installation of hardware

This section details the assembly that is required in order to use the ImageQuant LAS 4000.

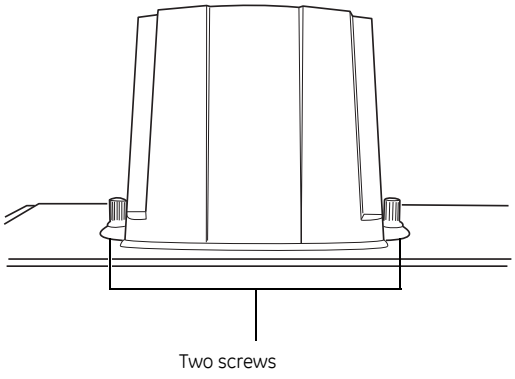
3.5.1 Attaching the camera head

The camera head is attached to the IDX as follows:

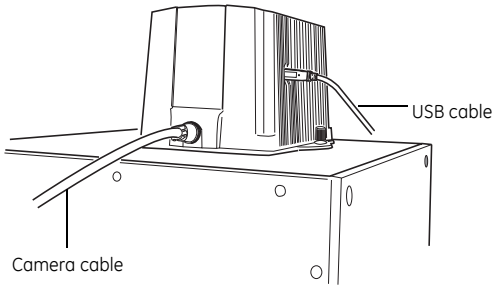
1 Install the camera head while pushing the lens release button against this side's wall surface of the camera hole.



2 Attach the two screws fixing the camera head.



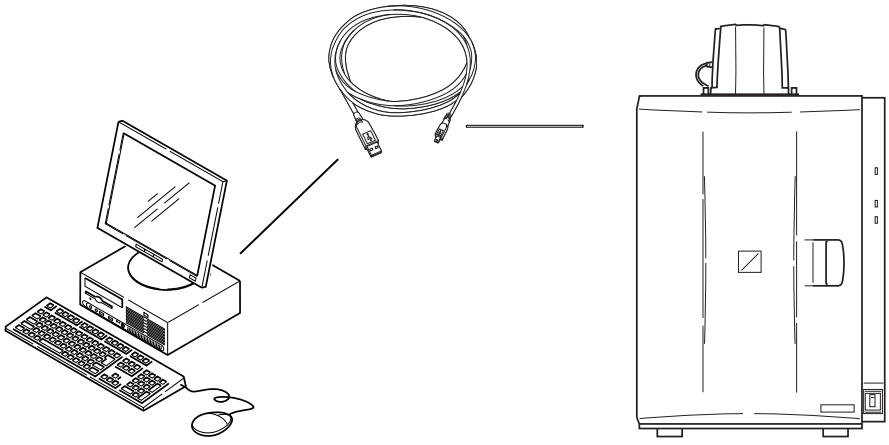
3 Connect the camera cable and USB cable.



4 Proceed to install the lens. See *Section 3.5.3 Installing the lens, on page 35*.

3.5.2 Connecting the camera head to the computer

Connect the USB cable from the USB connector of the ImageQuant LAS 4000 camera head to one of the USB ports of the computer.



Analysis PC (Optional) Instrument

Note:

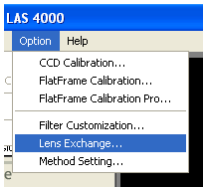
- *Use the USB cable supplied with the equipment.*
- *Do not connect via a USB hub.*
- *Do not use other USB equipment on the PC while ImageQuant LAS 4000 is in use. This may result in the loss of image data.*

3.5.3 Installing the lens

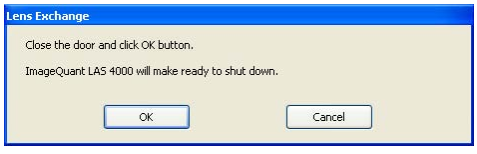
This section describes how to install the LAS High Sens. lens. For instructions on installing the wide view lens, refer to the ImageQuant LAS 4000 User Manual.

1 Ensure that the ImageQuant LAS 4000 and the PC are connected. Turn on the instrument and the PC and start the ImageQuant LAS 4000 Control Software.

2 Select ***Lens Exchange...*** in the ***Option*** menu.

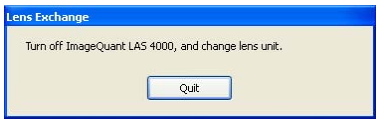


A message is displayed.



Click ***OK***.

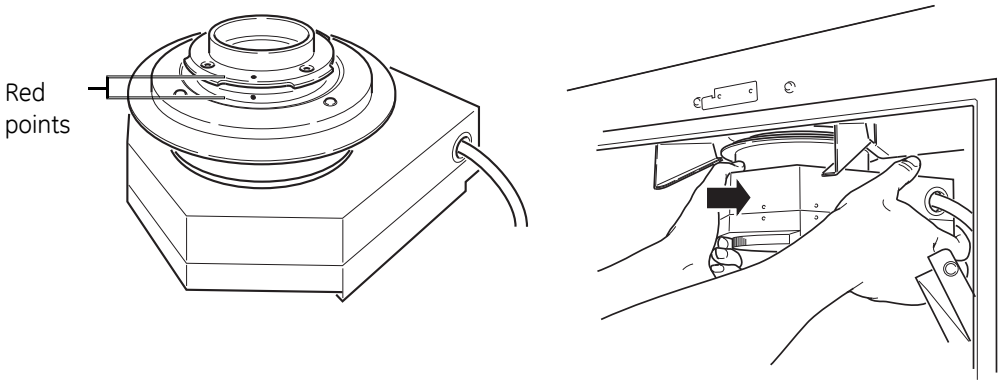
3



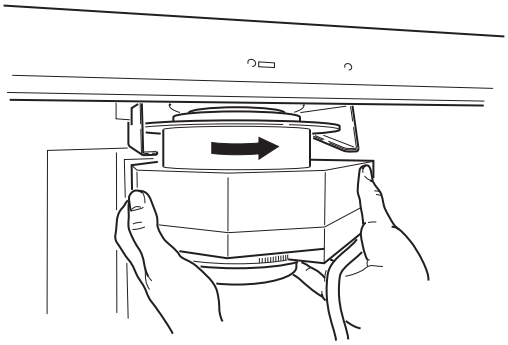
Turn off the instrument using the power switch.

4 Remove the end cap from the lens.

5 Insert the lens along the lens guide with the red point facing towards you.

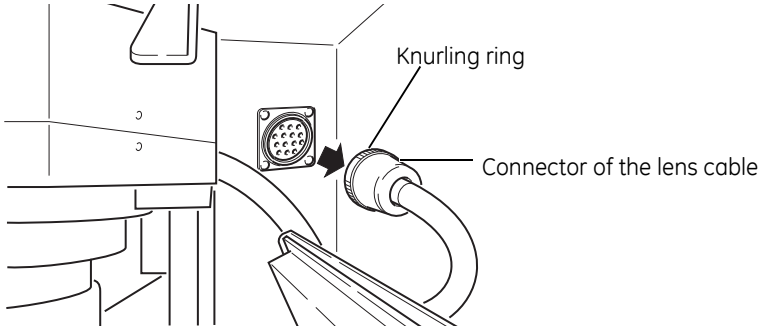


6 Raise the lens into position and rotate it clockwise to lock in position.



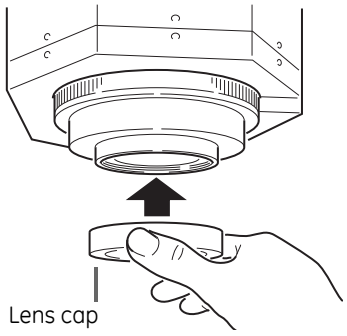
7 Connect the lens cable.

Turn the knurling ring until it is securely fixed.

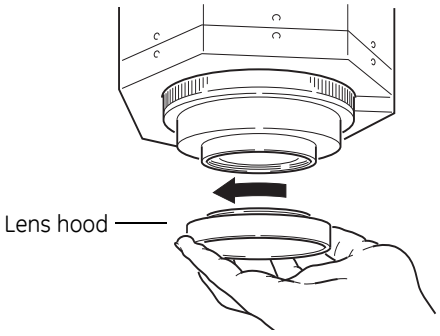


Note: *Be sure to connect the lens cable. Otherwise, the high sensitivity lens cannot be recognized. This may also cause malfunction.*

8 Remove the lens cap.



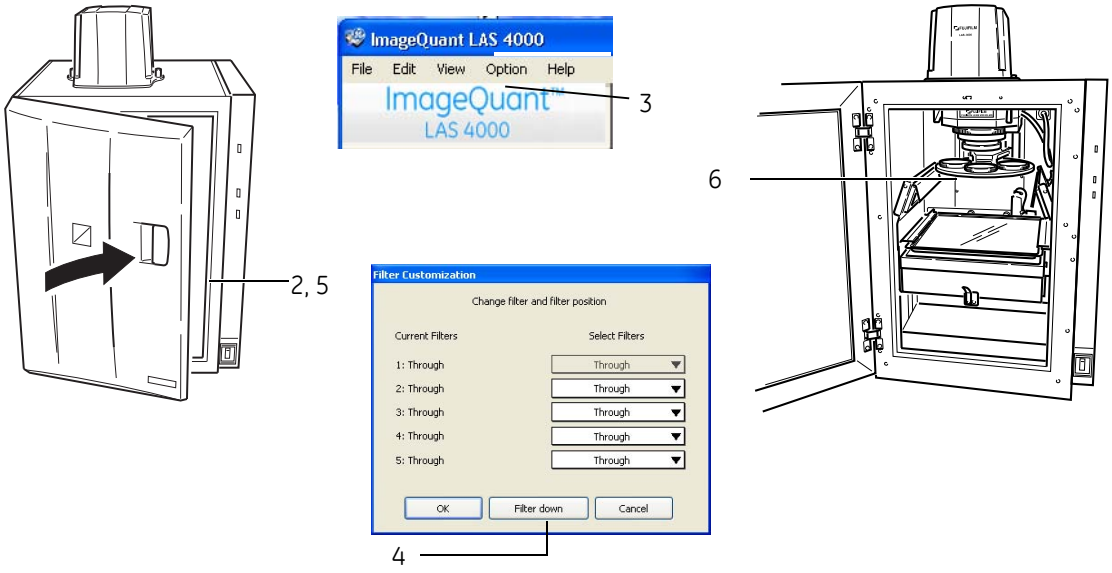
9 Install the lens hood.



3.5.4 Attaching a filter to the filter changer

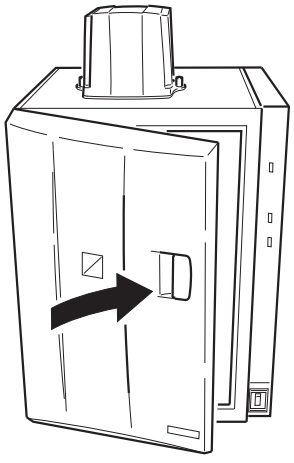
This section describes how to attach a filter to the filter changer, and how to register the filter at the chosen filter changer position in the ImageQuant LAS 4000 Control Software.

Note: *Before installing or changing filters in the filter changer, the ImageQuant LAS 4000 Control Software should be installed and running. For instructions on installing the software, refer to Section 3.4 Installation of the software, on page 27.*



1 Ensure that the camera head and PC are connected. Turn on the instrument and the PC, and start the ImageQuant LAS 4000 Control Software.

2 Close the instrument door



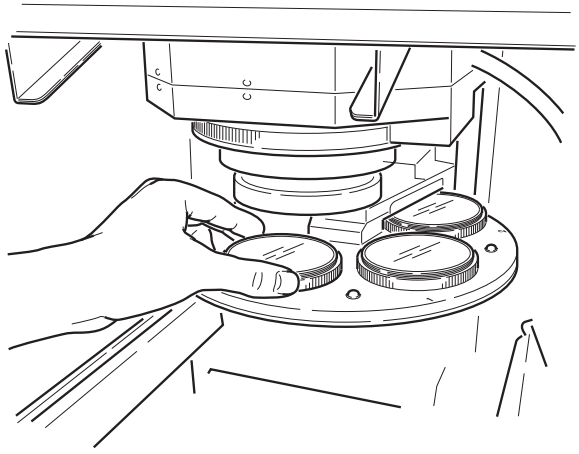
3 Select ***Filter Customization*** in the ***Option*** menu in the ImageQuant LAS 4000 Control Software main window.

4 Click the ***Filter down*** button.

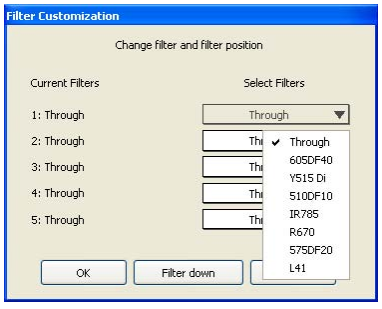
The filter changer is lowered.

5 Open the instrument door.

6 Turn the filter changer, put a filter in the desired position and secure it in place.



7 Select the appropriate filter from the drop-down list and click the ***OK*** button.

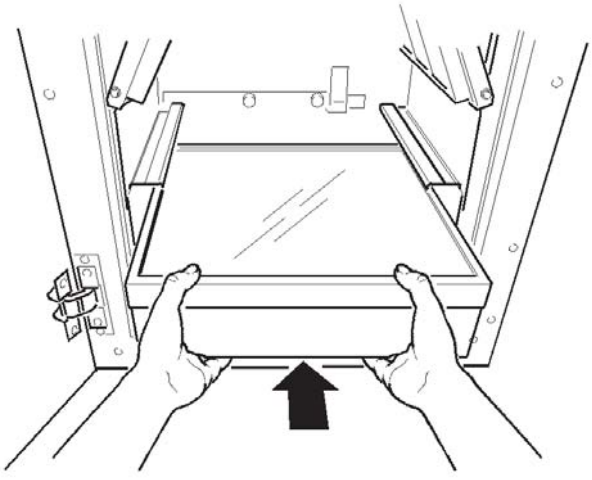


Note: *The filter changer returns to the original position when you click the* ***Start****,* ***Focusing*** *or* ***Method/Tray position*** *buttons.*

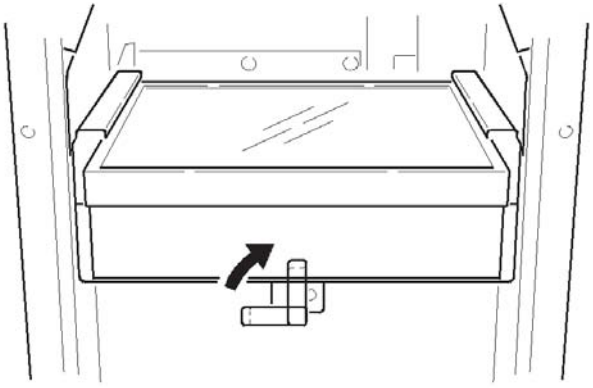
3.5.5 Installing a transmitted light source

This section describes how to insert the UV transilluminator or the white light table into the IDX.

1 Push the transmitted light source along the guide at the bottom of the IDX.



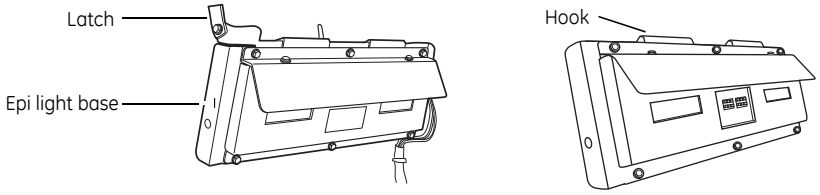
2 Turn the lever at the front to lock the light source into position.



3.5.6 Installing Epi light sources

This section describes how to install a set of Epi lights.

Note: *The tray should be at tray position 4 before installing Epi lights. If the tray is higher, then it should be lowered to tray position 4 using the ImageQuant LAS 4000 Control Software before attaching the lights, as described below.*



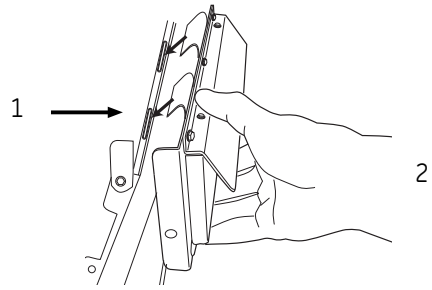
1 If the tray is at ***Tray position*** 4, proceed to step 3. Otherwise, close the IDX door.

2 Click on ***Method/Tray position***, set ***Tray position*** to 4, and click the ***OK*** button.

3 Open the IDX door.

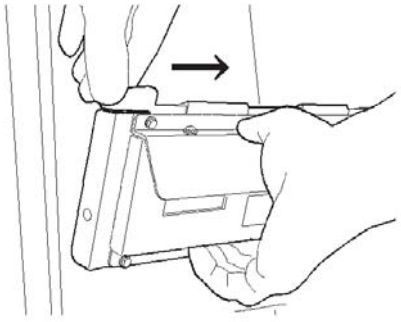
4 Ensure that the latch is sprung open (upwards).

5 Hook the hanger located on top of the Epi light to the top edge of the Epi light base.

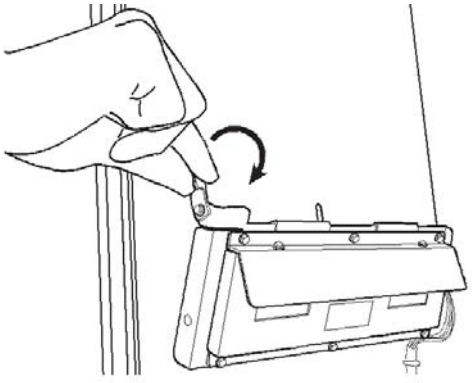


No.	Action
1	Two guide holes are located on the back of the Epi light base.
2	Slide the hook after attaching the guide pins to the guide holes.

6 Push the Epi light while holding the latch open, and slide it inwards until a click sound is heard.



7 Lower the latch to lock the Epi light in place.



8 Repeat steps 4 - 7 for the opposite side.

Note:

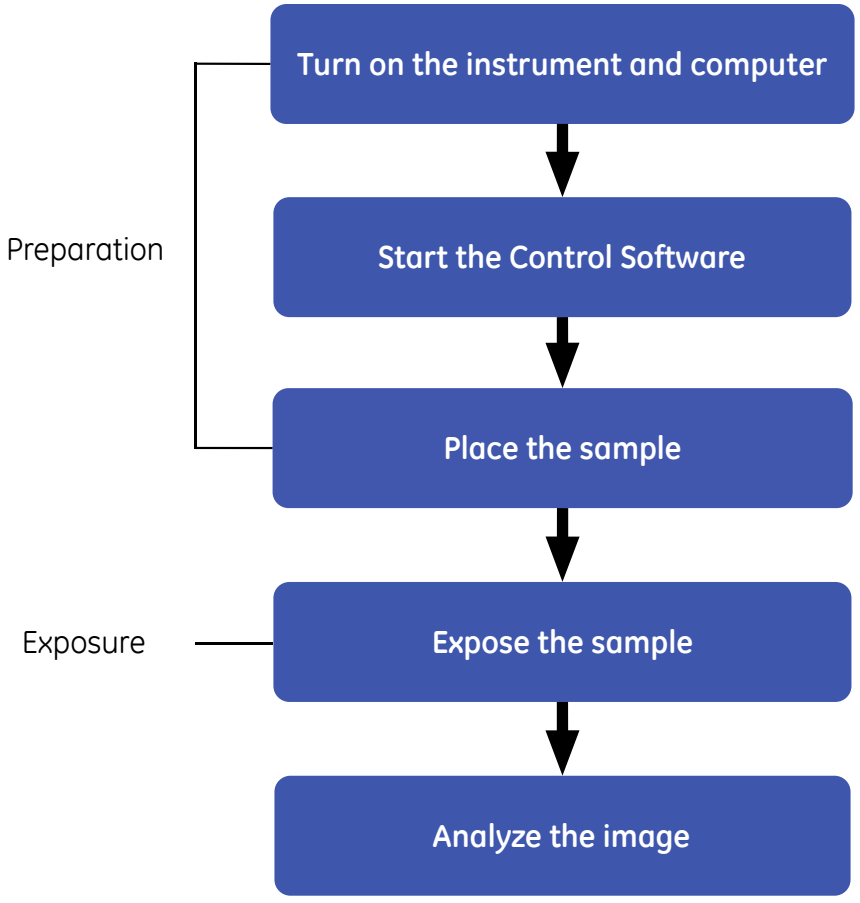
- *The Epi lights are clearly labelled **L** for the left and **R** for the right sides.*
- *Install the Epi lights in matching pairs only. If Epi lights with different wavelengths are used, the intended image will not be obtained.*

4 Operation

This chapter describes how to operate the ImageQuant LAS 4000 and how samples are to be placed in the instrument. The steps required to record an image are also described.

4.1 Operation overview

The general flow of operation is as follows:



4.2 Preparation

4.2.1 Starting the ImageQuant LAS 4000 and Control Software

The ImageQuant LAS 4000 and Control Software are started as follows:

1 Turn on the ImageQuant LAS 4000 and computer, and any auxiliary equipment.

Note: *The ImageQuant LAS 4000 and computer may be switched on in any order.*

2 Start the ImageQuant LAS 4000 Control Software.

Result: A status message is displayed while the ImageQuant LAS 4000 Control Software is starting.

3 Once the software has started, wait for the CCD camera to cool. The status of the CCD is shown in the main ImageQuant LAS 4000 Control Software window. When ready, the status will change from ***NOT READY*** to ***READY***.

Note: *When the CCD camera is ready for use, the **Power** LED lamp on the IDX lights blue.*

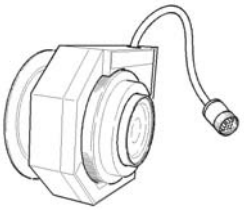
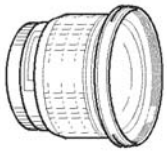
Note: *Under normal operation conditions, the cooling temperature of the CCD camera is set to -25°C.*

Note: *The **Method/Tray position** and **Focusing** may be set even if the CCD is not ready. A sample can be placed during the time taken for the CCD to cool.*

4.2.2 Preparing the ImageQuant LAS 4000 for exposure

Changing the lens

Two lenses can be used with the ImageQuant LAS 4000, an F0.85 43mm LAS High Sens. lens, and an optional F1.8 24mm wide view lens. The wide view lens can image samples up to 250 x 250 mm in size. For all other applications, the LAS High Sens. lens is recommended.

	
F0.85 43mm LAS High Sens. lens	F1.8 24mm wide view lens

For instructions on how to change the lens, refer to the ImageQuant LAS 4000 User Manual.

Changing the light sources

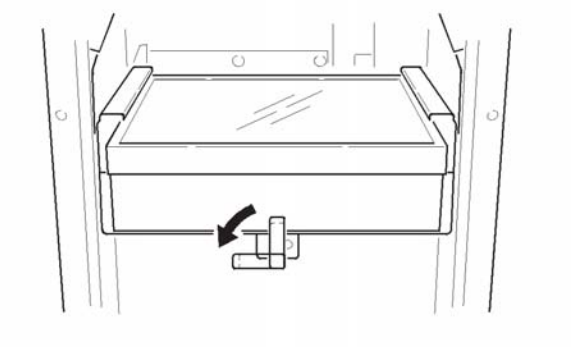
Both trans (transmitted) and epi (incident) light sources are available for exposure with the ImageQuant LAS 4000.

Type	Name	Peak wavelength
Transmitted	UV transilluminator	312 nm
	White light table	-
Incident	UV Epi light	365 nm
	Blue Epi light	460 nm
	Green Epi light	520 nm
	Red Epi light	630 nm
	NIR Epi light	710 nm
	White Epi light	-

Changing the transmitted light source

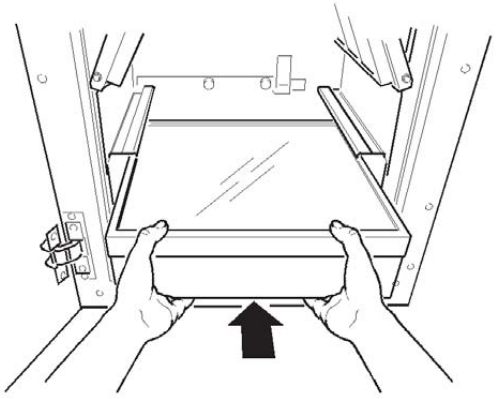
1 If no transmitted light source is currently in place inside the instrument, proceed to step 4.

2 Turn the lever holding the transmitted light source to unlock it.

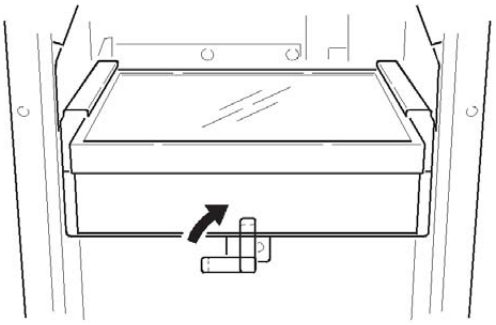


3 Pull out the transmitted light source carefully along the guide while holding it with both hands.

4 Push the new transmitted light source in along the guide at the bottom of the IDX.



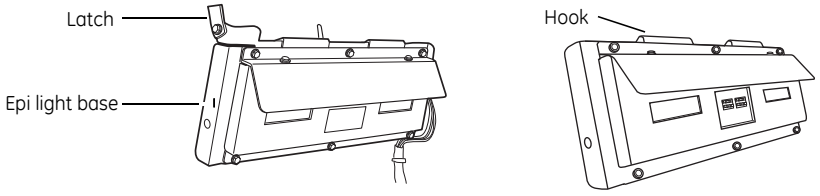
5 Turn the lever at the front to lock the light source into position.



Changing the Epi lights

This section describes how to change a set of Epi lights.

Note: *The tray should be at tray position 4 before installing Epi lights. If the tray is higher, then it should be lowered to tray position 4 using the ImageQuant LAS 4000 Control Software before attaching the lights, as described below.*

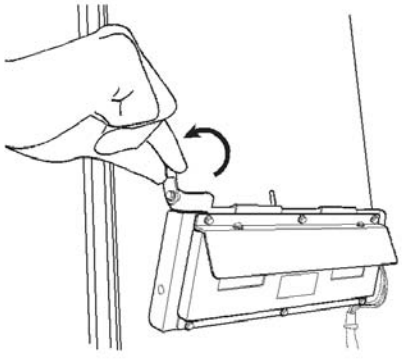


1 If the tray is at ***Tray position*** 4, proceed to step 3. Otherwise, close the IDX door.

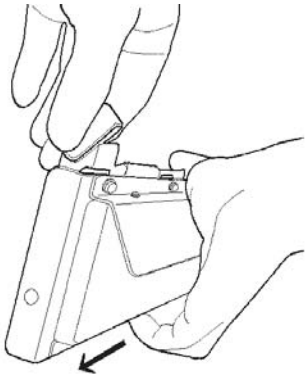
2 Click on ***Method/Tray position***, set ***Tray position*** to 4, and click the ***OK*** button.

3 Open the IDX door. If no Epi light is currently in place inside the instrument, proceed to step 7.

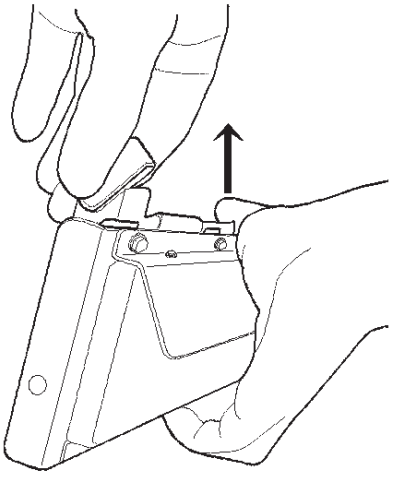
4 Spring up the latch to unlock the Epi light.



5 Holding the latch with one hand, remove the Epi light by pulling it gently outwards.

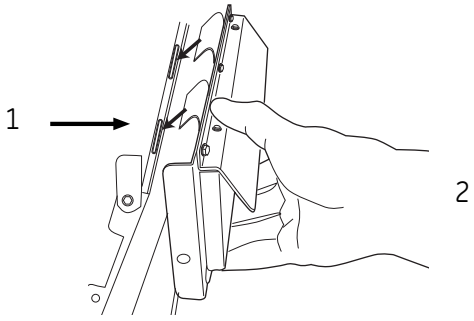


6 Lift up and remove the Epi light.



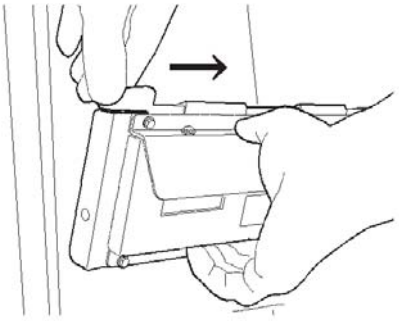
7 Before installing the new Epi light, ensure that the latch is sprung open (upwards).

8 Hook the hanger located on top of the Epi light to the top edge of the Epi light base.

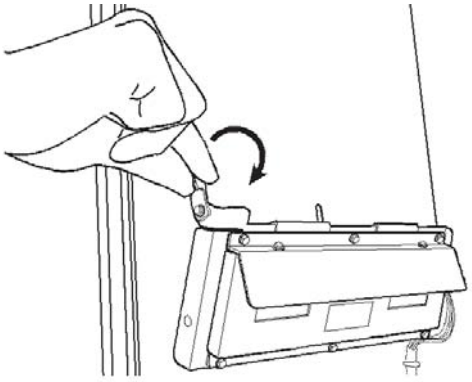


No.	Action
1	Two guide holes are located on the back of the Epi light base.
2	Slide the hook after attaching the guide pins to the guide holes.

9 Push the Epi light while holding the latch open, and slide it inwards until a click sound is heard.



10 Lower the latch to lock the Epi light in place.



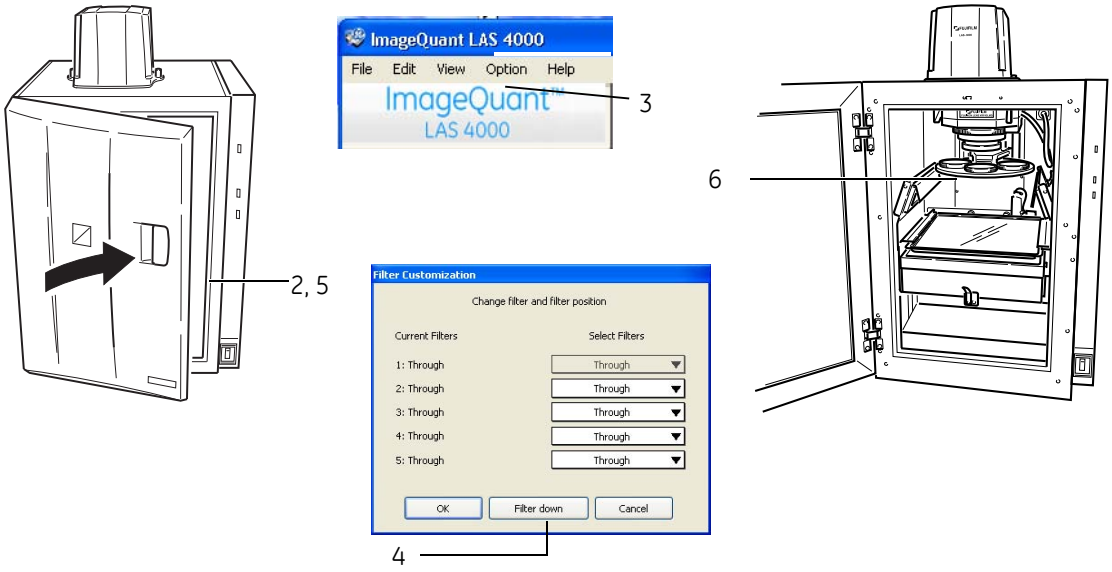
11 Repeat this process for the opposite side.

Note:

- *The Epi lights are clearly labelled **L** for the left and **R** for the right sides.*
- *Install the Epi lights in matching pairs only. If Epi lights with different wavelengths are used, the intended image will not be obtained.*

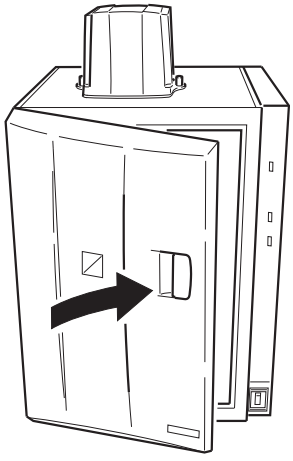
Changing or installing a filter

Optical filters can be inserted in the filter turrent and registered in the ImageQuant LAS 4000 Control Software as follows:



1 Ensure that the camera head and PC are connected. Turn on the instrument and the PC, and start the ImageQuant LAS 4000 Control Software.

2 Close the instrument door



3 Select ***Filter Customization*** in the ***Option*** menu in the ImageQuant LAS 4000 Control Software main window.

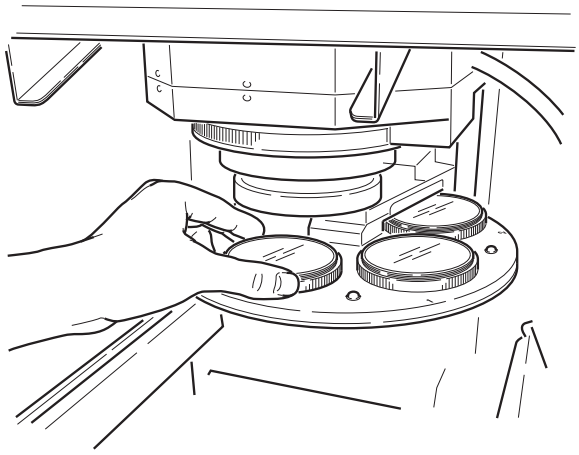
4 Click the ***Filter down*** button.

The filter changer is lowered.

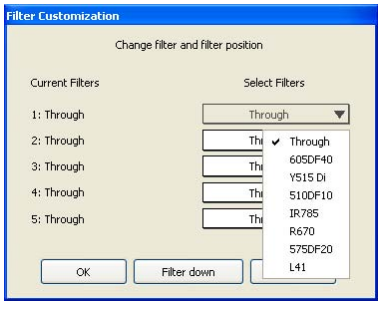
5 Open the instrument door.

6 Turn the filter changer so the desired position is easily accessible. If a filter is already in place at this position, unscrew it carefully and put it back in its cover.

7 Screw the new filter into place.



8 Select the appropriate filter from the drop-down list and click the ***OK*** button.



Note: *The filter changer returns to the original position when you click the **Start**, **Focusing** or **Method/Tray position** buttons.*

4.2.3 Placing the sample

This section describes how to choose an appropriate sample tray, and how to place the sample for exposure.

1 Select a sample tray suitable for the type of exposure to be performed.

Detection	Sample type	Tray
Chemiluminescence Bioluminescence	Membrane	Epi tray
	Titer plate	NP tray
Fluorescence	Gel (UV Trans illumination)	UV trans tray
	Gel (Epi illumination)	Epi tray
	Membrane	Epi tray

Detection	Sample type	Tray
Digitization	Membrane	Epi tray
	Gel (Coomassie, silver stain)	White trans tray

2 Place a sample on the sample tray.

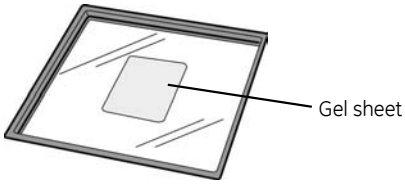
For Epi tray

a Place the sample directly on the tray.

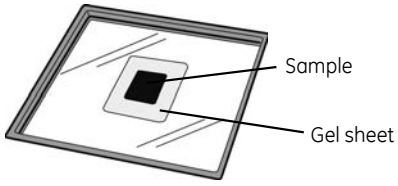
For UV or White Trans trays

a Cut out a gel sheet slightly larger than the sample size.

b Place the gel sheet on the Trans tray.



c Place the sample on the gel sheet.

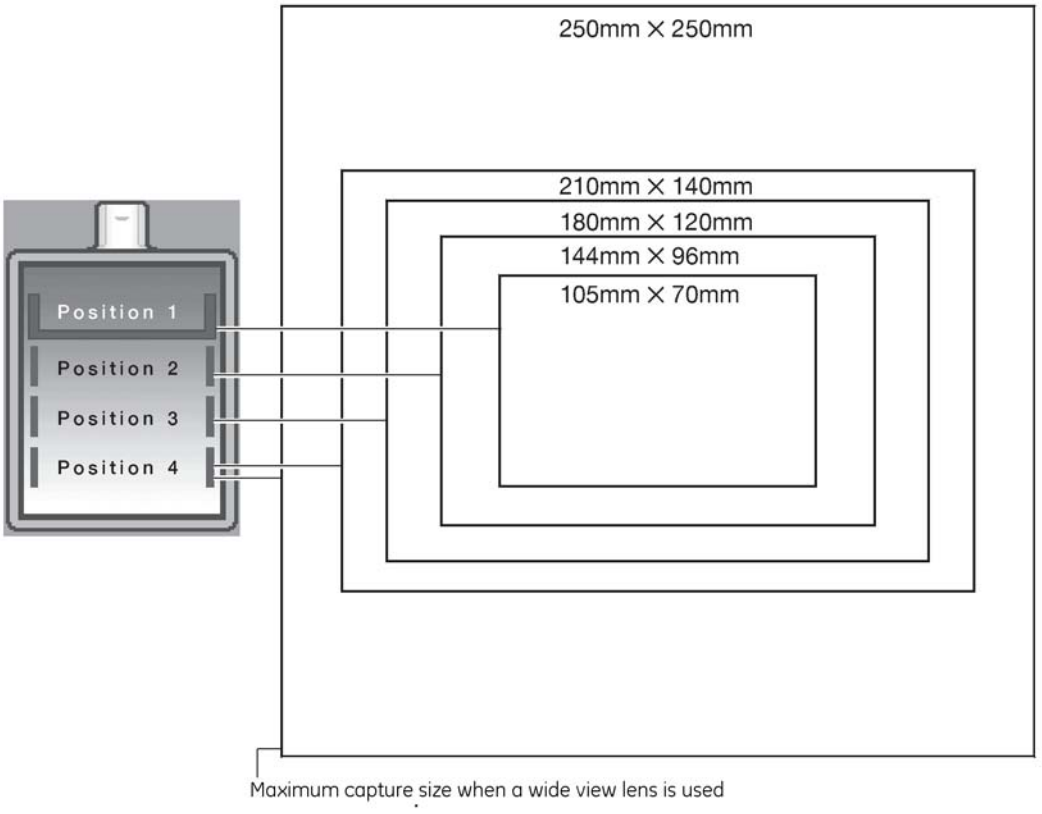


Note: *The gel sheet can be used repeatedly. After use, wash it with mild detergent, rinse with water then dry well. A gel sheet can be reused about 20 times.*

3 Choose the exposure size and tray position

For Epi and Trans trays

- The readable area varies depending on the tray position. Place the sample in position according to its size.



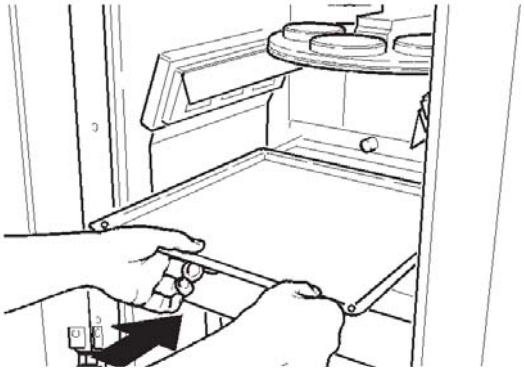
TIP: On the Epi tray, there are round dents marked on the tray for positioning the sample. Line up the sample using the appropriate dents.

For NP tray

- The NP tray is to be used at tray position 3.

Note: *The readable area will be slightly smaller using the F1.8 wide view lens.*

4 Open the IDX door and insert the tray. Place the Epi or Trans trays in position with the side with a hole facing outwards.



5 Ensure the lens cap is removed and close the IDX door.

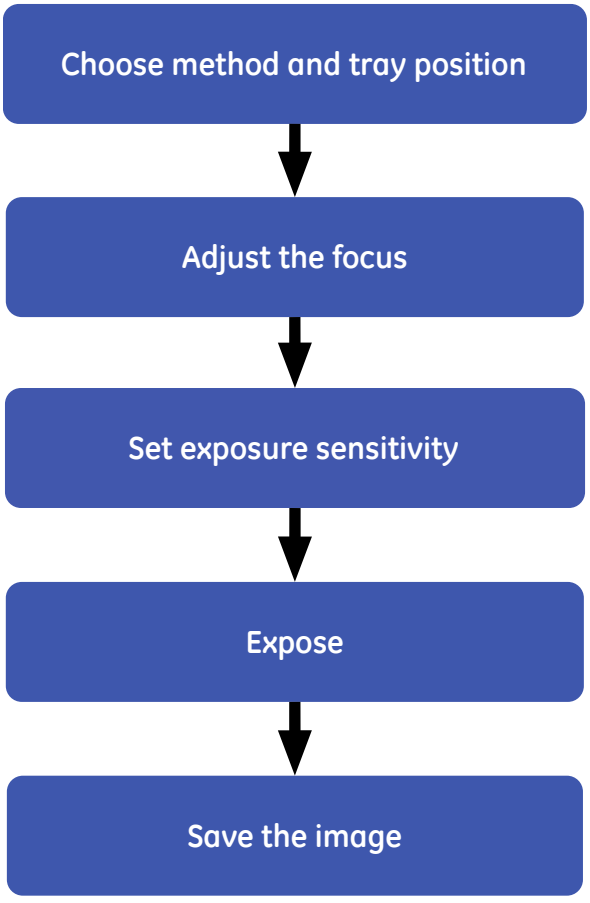
4.3 Performing an exposure

This section describes the steps for exposing a sample and saving the image. In this description the screen images shown are for exposure of an ethidium bromide (EtBr) stained sample. The general procedure is however similar for all types of sample. For detailed instructions refer to the ImageQuant LAS 4000 User Manual.

Images may also be obtained by repeated, incremental or programmed exposure of a sample. For detailed instructions on these types of exposure, refer to the ImageQuant LAS 4000 User Manual.

4.3.1 Workflow

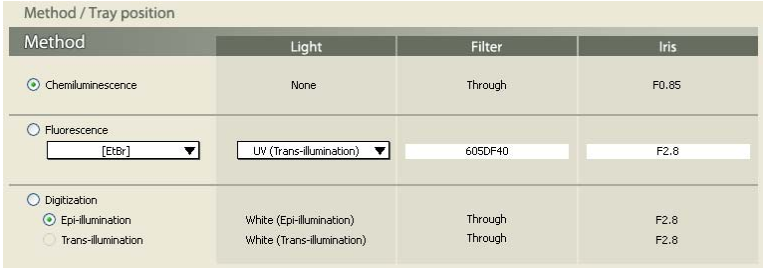
The workflow for exposing a sample and recording an image is as follows:



4.3.2 Choose method and tray position

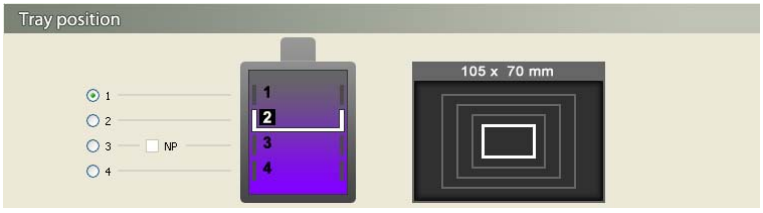
Step	Action
1	Click the ***Method/Tray position*** button. *Result*: The ***Method/Tray position*** dialog opens.

Step	Action
2	Select a ***Method*** for exposure.



Detection	Method
Chemiluminescence Bioluminescence	Chemiluminescence
Fluorescence using UV transilluminator (312 nm)	Fluorescence: EtBr
Fluorescence using UV Epi light (365 nm)	Fluorescence: DAPI
Fluorescence using Blue Epi light (460 nm)	Fluorescence: Cy2, GFP
Fluorescence using Green Epi light (520 nm)	Fluorescence: Cy3
Fluorescence using Red Epi light (630 nm)	Fluorescence: Cy5
Fluorescence using NIR Epi light (710 nm)	Fluorescence: DAPI
Sample digitization using White Epi light	Digitization: Epi-illumination
Sample digitization using White light table	Digitization: Trans-illumination

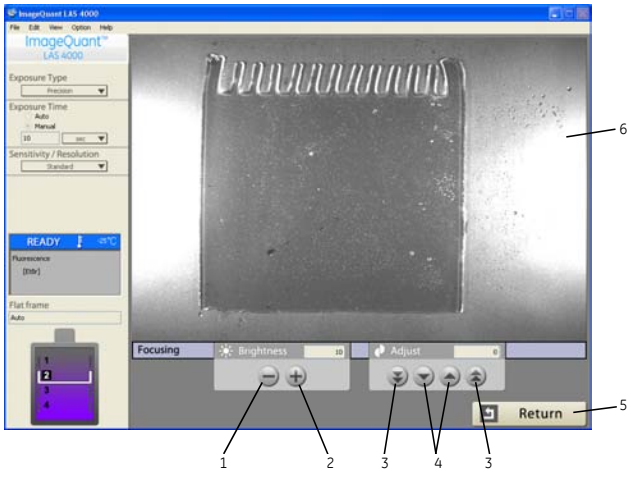
3	Select ***Tray position*** according to the sample size or type.



4	Click the ***OK*** button

4.3.3 Focus adjustment

Step	Action
1	Click the ***Focusing*** button. *Result*: The focusing controls appear.



Part	Function
1	Decrease image brightness
2	Increase image brightness
3	Coarse focus adjustment
4	Fine focus adjustment
5	Return to the main display
6	Click on the image to zoom

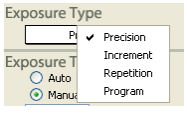
Note: *Adjusting the brightness does not influence the actual exposure.*

2	Check that the sample is correctly positioned and focus the image.
3	Click the ***Return*** button.

4.3.4 Set exposure type and exposure time

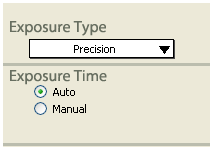
For a detailed description of the different exposure types, refer to the ImageQuant LAS 4000 User Manual.

Step	Action
1	Select the ***Exposure Type*** from the drop-down list.



Step	Action
2	Select ***Auto*** or ***Manual*** for ***Exposure Time***.

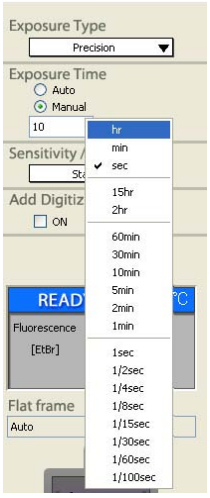
- ***Auto***:



Note: *Automatic exposure time setting may not be possible depending on the sample type and method.*

- ***Manual***:

  Select an exposure time from the drop-down list or enter the exposure time manually. The exposure time can be set from 0.01 seconds up to 30 hours.



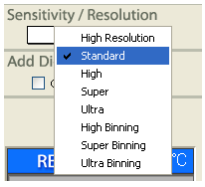
4.3.5 Set exposure sensitivity

The sensitivity can be improved by binning multiple pixels into one larger pixel. Smoothing by interpolation then increases the number of pixels for the final image. The sensitivity increase in order ***Standard***, ***High***, ***Super*** and ***Ultra***.

Sensitivity	No. pixels (binned) W x H	No. pixels (final image) W x H
High Resolution	3072 x 2048	3072 x 2048
Standard	1536 x 1024	1536 x 1024
High	768 x 512	1536 x 1024
Super	384 x 256	1536 x 1024
Ultra	192 x 128	1536 x 1024
High Binning	768 x 512	768 x 512

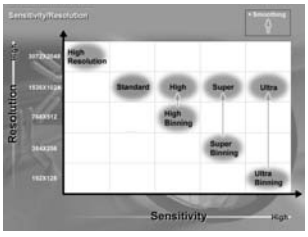
Sensitivity	No. pixels (binned) W x H	No. pixels (final image) W x H
Super Binning	384 x 256	384 x 256
Ultra Binning	192 x 128	192 x 128

Step	Action
1	Select ***Sensitivity*** from the drop-down list.



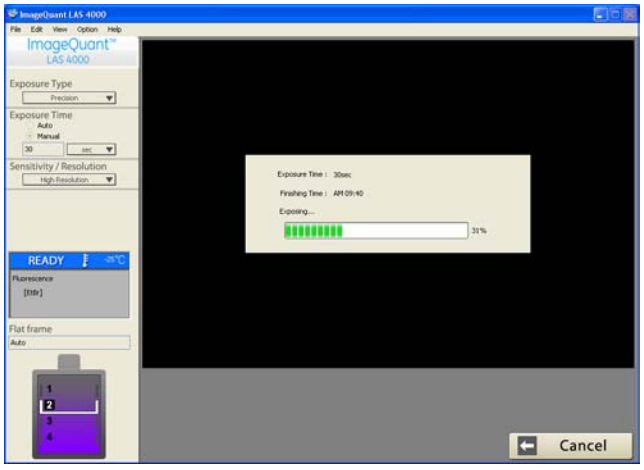
Note: *The **Add Digitization Image** function can be used for chemiluminescent samples. This creates a composite image of a chemiluminescence exposure and a digitized white light exposure (in order to add an image of an opaque molecular marker) with a single click.*

TIP: Select ***Sensitivity/Resolution...*** in the ***Help*** menu. This displays a diagram that describes the relation between sensitivity and resolution.



4.3.6 Exposure

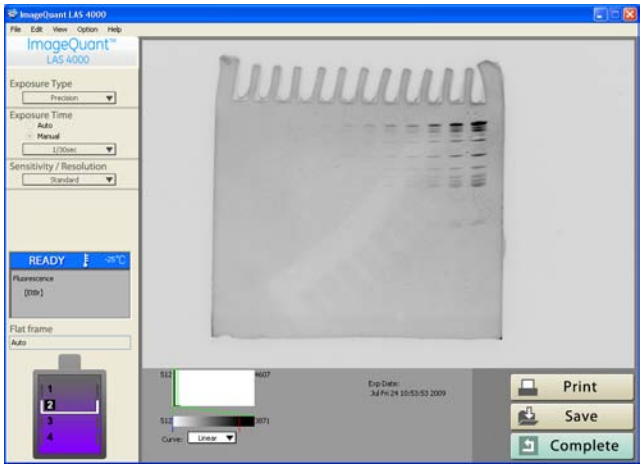
Step	Action
1	Click the ***Start*** button to begin exposure.



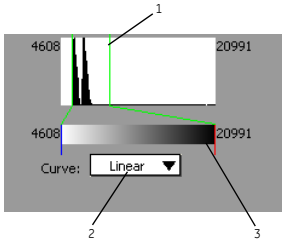
Note: *The orange **Busy** LED lights on the ImageQuant LAS 4000 during exposure.*

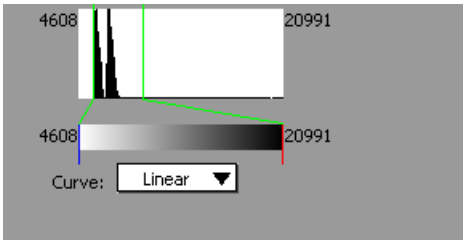
4.3.7 Save the image

Once the sample has been exposed, the image will be loaded into the main window.

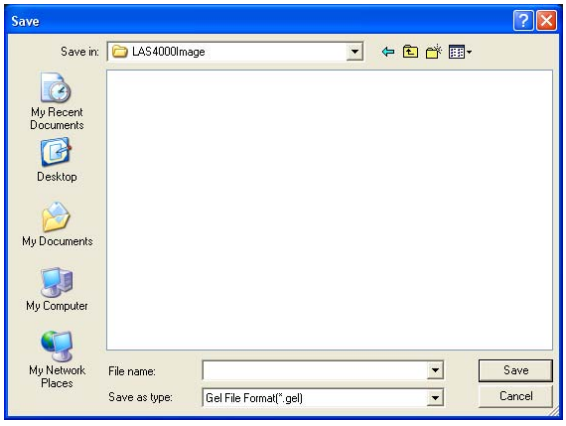


Step	Action
1	Adjust the saturation and contrast of the image using the controls at the bottom of the window.



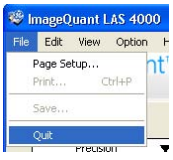


Part	Function
1	Adjust the dynamic range by dragging the limits with the mouse.
2	The gradation conversion curve can be toggled between ***Linear*** or ***Sigmoid***.
3	The gradation can be altered by dragging with the mouse.

Step	Action
2	Click the ***Save*** button or select ***Save*** in the ***File*** menu to save the image. *Result*: The ***Save*** dialog opens. 
2	Choose a folder, file name and file format, then click the ***Save*** button. ***Note:*** ***.gel*** *format:* *A file format developed by GE Healthcare. Exposure details are maintained.* ***.tiff*** *format:* *A 16-bit TIFF format suitable for analysis in external software. Exposure details are not maintained.*
3	Click the ***Complete*** button. *Result*: The current display returns to the initial screen.

4.4 After exposure

If the ImageQuant LAS 4000 will not be used for some time, it should be switched off as follows.

Step	Operation
1	Select ***Quit*** from the ***File*** menu. 

Step	Operation
2	Select ***Stop the CCD cooling now***. Click the ***OK*** button. **TIP:** If ***Keep the CCD cooling after quit*** is selected, the cooling temperature of the CCD will be maintained, and you can immediately start using it upon simply restarting ImageQuant LAS 4000 Control Software. This is useful if more samples will be exposed later in the day.
3	Switch off the computer.
4	Turn off the ImageQuant LAS 4000 power switch.

5 Maintenance

To ensure optimal performance, the ImageQuant LAS 4000 and accessories should be maintained regularly. This chapter describes the maintenance that should be performed on a regular basis.

NOTICE

Before performing any maintenance on or inside the ImageQuant LAS 4000, be sure to turn off the power switch and remove the power plug from the electrical outlet.

5.1 ImageQuant LAS 4000

Use a soft dry cloth to clean the exterior of the ImageQuant LAS 4000. For marks that are hard to remove, wipe with a soft cloth slightly dampened with a neutral detergent, then wipe with a new clean, dry cloth.

To clean the interior of the instrument, use a non-fluorescent cleanser for biochemical use. If using a neutral domestic detergent, the detergent residue may fluoresce when exposing images.

NOTICE

Do not use organic solvents. These may damage the surface.

5.2 Sample trays

After using a sample tray, wash it in water using a soft sponge dipped in a neutral detergent. After cleaning leave the tray to air dry.

WARNING

Wear gloves while cleaning. There may be residues of hazardous chemicals.

NOTICE

Do not use organic solvents. These may damage the surface.

NOTICE

Do not use abrasive cleaning materials, such as a scouring pad, for cleaning. This may scratch the surface.

5.3 Lens, filters, NP tray and Epi light sources

Use a soft dry cloth only to clean these components.

To maintain image quality when cleaning optical components, the following points should be observed:

- Never touch the optics (lens, camera head window, filter surfaces or Epi light windows) with bare hands.
- Use an air blower to remove dirt or dust. If the optics have been touched accidentally, wipe the soiled surface using lens cleaning paper dipped in lens cleaner solution. Any grease allowed to remain on the surface may become difficult to remove, cause degeneration and possibly molding.
- Do not adjust fixing screws or tie rings on the components unnecessarily. This may cause the performance to deteriorate.
- Use the protective caps on the camera head and lens whenever they are not installed in the ImageQuant LAS 4000. Store these protective caps carefully.
- Do not allow dirt or dust to accumulate on the inlet and outlet vents of the camera head. Use a soft, dry cloth to clean them.

5.4 UV transilluminator and white light table

Use an air blower to remove dust. Greasy residues can be cleaned with a soft cloth dampened with mild detergent, then wipe with a soft, dry cloth.

WARNING

Wear gloves while cleaning. There may be residues of hazardous chemicals.

5.5 Regular inspections

Regularly inspect the ImageQuant LAS 4000 to ensure the following:

- The power supply plug is firmly secured in the power outlet.
- The power cable and supply plug do not become overheated.
- The power cable is not damaged in any way.
- The ventilation holes in the equipment are free from dust and dirt.

- The lights do not remain lit, and the tray rail or filter changer do not move when the IDX door is opened.

6 Troubleshooting

This chapter describes various problems that can foreseeably occur with the ImageQuant LAS 4000 and ImageQuant LAS 4000 Control Software. Suggestions of possible countermeasures are given.

Take the following procedures if an error occurs:

1 Take note of the error code and error message on the monitor.

2 Turn off the power to ImageQuant LAS 4000 and the analysis PC, then turn them on again after about ten seconds.

3 If the error persists, fill in the necessary items and the error code in the Service report fax sheet at the end of the ImageQuant LAS 4000 User Manual, and then contact your GE Healthcare representative.

6.1 Problems with the exposed image

Phenomenon	Cause	Countermeasure
An appropriate image does not appear	Image is overexposed	Shorten the exposure time or check the iris setting
	Image is underexposed	Make the exposure time longer or check the iris setting
	The focus is not correctly adjusted	Adjust the focus correctly
	The tray, lens or filter are dirty	Clean the tray, lens and filter. See *Chapter 5 Maintenance, on page 61*.
	The wrong filter is in place	Install the correct filter
	The wrong lens is installed	Install the correct lens
	The wrong sample tray is being used	Change to the correct sample tray
	The wrong light source is selected	Select the correct light source
	The Flat Frame file is not exposed correctly	Expose the Flat Frame again
	The size of the object to be exposed does not coincide with the exposed area	Place the sample correctly on the sample tray and place the tray at the correct tray position
Light leaks on the image	The ImageQuant LAS 4000 door is not closed completely	Close the ImageQuant LAS 4000 door and expose the image again
	Exposure to direct sunlight	Avoid direct sunlight
The image appears misty	Dew condensation in the optical system	Quit the ImageQuant LAS 4000 Control Software and wait until the operation environment meets the required specifications

Phenomenon	Cause	Countermeasure
Unevenness is seen on the image	Light source unevenness	Check that both left and right Epi light sources are correctly in place and that they are of the same type
	A lamp in the UV transilluminator is broken.	Turn the power off and contact your GE Healthcare representative
	The Flat Frame is not correctly exposed.	Expose the Flat Frame again
There is noise on an image exposed using UV trans tray	Degradation of UV trans tray	Purchase a new UV trans tray.

6.2 Strange sounds or odors are perceived

Phenomenon	Cause	Countermeasure
The camera head generates a strange noise	Camera head failure	Turn off the ImageQuant LAS 4000 power switch immediately and contact your GE Healthcare representative
The camera head generates a strange odor	Camera head failure	Turn off the ImageQuant LAS 4000 power switch immediately and contact your GE Healthcare representative
The camera head emits smoke	Camera head failure	Turn off the ImageQuant LAS 4000 power switch immediately and contact your GE Healthcare representative
ImageQuant LAS 4000 beeps on and off (four times, at intervals of three minutes) and the **Busy** LED blinks	The door is open	Close the door. The subsequent processing should start.

Phenomenon	Cause	Countermeasure
ImageQuant LAS 4000 beeps on and off (three times) and the **ERROR** LED lights	A hardware error occurred	See the countermeasures for the ***SensKey*** and ***SensCode*** numbers displayed on screen of the analysis PC in *Section 6.5 Message "ImageQuant LAS 4000 hardware error occurred", on page 69*
ImageQuant LAS 4000 generates a strange odor	ImageQuant LAS 4000 failure	Turn off the ImageQuant LAS 4000 power switch immediately and contact your GE Healthcare representative
ImageQuant LAS 4000 emits smoke	ImageQuant LAS 4000 failure	Turn off the ImageQuant LAS 4000 power switch immediately and contact your GE Healthcare representative

6.3 Problems with ImageQuant LAS 4000

If the error persists even after the following countermeasures have been taken, fill in the necessary items and the error code in the Service report fax sheet at the end of the User Manual.

Phenomenon	Cause	Countermeasure
LED lights on ImageQuant LAS 4000 do not light during startup diagnosis	Power cable installation failure	Connect the power cable correctly
The ImageQuant LAS 4000 door cannot be opened and closed. The door cannot be locked	Foreign object is present in the locking section or door sensor	Remove the foreign object
	The locking section is damaged.	Contact your GE Healthcare representative
The initial diagnosis does not start even if the power is turned on	The camera cable is not connected correctly	Turn the power off and check the camera cable connection
A focused image is not displayed	Power cable and camera cable connection failure	Connect the AC power cable and camera cable correctly
	Connector connection failure. Light failure.	Connect the trans light source by pushing it all the way until it hits the other end. Lock the Epi lights in place.
	Foreign object is present in the door sensor	Remove the foreign object
	Software is not in the ***Focusing*** mode	Click the ***Focusing*** button in the software

Phenomenon	Cause	Countermeasure
The light source is lit even when the ImageQuant LAS 4000 door is opened	Interlock failure	Turn off the power immediately and contact your GE Healthcare representative

6.4 Problems with ImageQuant LAS 4000 Control Software

If the error persists even after the following countermeasures have been taken, fill in the necessary items and the error code in the Service report fax sheet at the end of the User Manual.

Phenomenon	Cause	Countermeasure
ImageQuant LAS 4000 Control Software cannot recognize ImageQuant LAS 4000	USB cable connection failure	Connect the USB cable correctly to the camera head and PC
	Power cable or camera cable connection failure	Connect the power cable and camera cable correctly
The CCD temperature indication does not change to ***READY*** or its value does not approach the set temperature (after a sufficient time – about 15 minutes – has elapsed since the start of cooling)	The ambient temperature is too high.	Set the ambient temperature to 28°C or less
	The CCD temperature is set too low	Set the cooling temperature of the CCD properly
	USB cable connection failure	Connect the USB cable correctly
	The camera head ventilation holes are blocked	Confirm that nothing is blocking the ventilation holes
No focus image is displayed in the ***Focusing*** mode	USB cable connection failure	Connect the USB cable correctly
	Brightness of reading software is too high or low	Adjust the ***Brightness*** in the reading software
	The lens is not correctly installed	Install the lens correctly
	The iris is not correct	Check the iris value
	The image is noticeably out of focus	Adjust the focus
Even when the set exposure time has elapsed, the reading operation is not completed.	The ImageQuant LAS 4000 power has been turned off during exposure	Turn the power switch of the ImageQuant LAS 4000 on and reboot it

Phenomenon	Cause	Countermeasure
After exposure, no image is displayed on the monitor	The exposure time is too short	Make the exposure time longer
	The light source is not correct	Install the correct light source
	The filter is not correct	Install the correct filter
	The sample is not in position	Check the sample position
	The focus is not correct	Adjust the focus
Exposure cannot be performed even if the ***Start*** button has been pressed	USB cable connection failure	Connect the USB cable correctly
The LAS High Sens. lens is not recognized	Lens cable connection failure	Connect the lens cable correctly
The light source is not recognized	The light source is not connected correctly	Connect the light source correctly
The lifting table does not move the tray to the correct position	USB cable connection failure	Connect the USB cable correctly
No button is displayed in ***Focusing*** mode	Lens cable connection failure	Connect the lens cable correctly
	The wide view lens is installed	Adjust the focus manually when using the wide view lens

6.5 Message "ImageQuant LAS 4000 hardware error occurred"

SensKey: **** H SensCode:*** **** * * * H*** is displayed.

If the error persists even after the following countermeasures have been taken, fill in the necessary items and the error code in the Service report fax sheet at the end of the User Manual, and then contact your GE Healthcare representative.

SensKey	SensCode	Content	Countermeasure
2	8000	UV exposure error	If the problem remains, restart the ImageQuant LAS 4000 and ImageQuant LAS 4000 Control Software
	9100	Temperature adjustment error	Turn off the ImageQuant LAS 4000 power for a while. After that, restart the ImageQuant LAS 4000 and ImageQuant LAS 4000 Control Software

SensKey	SensCode	Content	Countermeasure
3	B001	Lifting table error during startup diagnosis	Restart the ImageQuant LAS 4000 and ImageQuant LAS 4000 Control Software
	B002	Filter changer error during startup diagnosis	
	B004	Focus error during startup diagnosis	
	B008	Iris error during startup diagnosis	
	B010	Epi light source error during startup diagnosis	
	B020	UV transluminator error during startup diagnosis	
	B040	White light table error during startup diagnosis	
	B0 * * except described above	A combination of errors B004 to B020 above are generated during startup diagnosis	
	B101	Lifting table error	
	B102	Filter changer error	
	B104	Focus error	
	B108	Iris error	
	B110	Transmitted light source error	
	B120	UV transilluminator error	
	B140	White light table error	
	B1 * * except described above	Errors B104 to B120 above are generated in combination.	
4	A000	Communication error between camera head and ImageQuant LAS 4000	Restart the ImageQuant LAS 4000 and ImageQuant LAS 4000 Control Software
	A100	Communication retry error between camera head and ImageQuant LAS 4000	
	A200		

SensKey	SensCode	Content	Countermeasure
		Communication parameter error between camera head and ImageQuant LAS 4000	
	D000	Memory error during startup diagnosis	
	D100	Image data memory error during startup diagnosis	
	D2 * *	Shutter error during startup diagnosis	
	D300	Time-out error of startup diag-nosis	
	D400	Time-out error of filter or iris operations	
	D500	Time-out error of lifting table operation	
	D600	Interrupt processing error	
	D700	LED connection error	
	D800	Board fan error	
	D900	Camera head fan error	
	DC00	Shutter error during exposure	
	E000	OS system call error	

6.6 Error messages and countermeasures

The tables below describe error messages that can foreseeably be generated by the software. These are categorized according to the operation that can cause the error, along with an explanation of the error and an appropriate countermeasure.

For a description of hardware errors, see *Section 6.5 Message "ImageQuant LAS 4000 hardware error occurred" , on page 69*.

General error messages

Error message	Meaning	Countermeasure
The hard disk is full.	Disk space is insufficient	Free some disk space
Cannot save. Disk capacity is insufficient.		
Exposure failed. Disk working space is insufficient.		
Cannot save. File I/O Error.	An error occurred during writing the file	Check the file name and folder are correct. Check that the PC is operating correctly.
Cannot save. The folder is write-protected.	The folder to which the file is to be written is write-protected	Save to a different folder or cancel the write-protection
The folder is write-protected. Please change the folder.		
Cannot save. A file with the same name is write-protected.	A file with the same name is write-protected	Cancel the write-protection of the file or save to a file with a different name
File open error.	An error occurred while opening the file	Check the correct file is chosen. Check the PC is operating correctly. In the worst case, the file may have become corrupted.
Please close the door.	The IDX door is open	Close the door
Can not use the characters below for the filename. :"<>\/*?|	The filename contains invalid characters	Change the filename, excluding the invalid characters

Start up

Error message	Meaning	Countermeasure
The environmental temperature is too high to cool the CCD.	The ambient temperature is too high for the CCD to cool	Turn off the the ImageQuant LAS 4000, reduce the air temperature around the instrument, and then restart ImageQuant LAS 4000 and ImageQuant LAS 4000 Control Software

Error message	Meaning	Countermeasure
Components in ImageQuant LAS 4000 have changed. Please change the exposure method.	The default settings have been changed	Change the method and/or the tray position in the ***Method/Tray Position*** dialog
Please change settings in Method/Tray Position window.		

Start button - starting exposure

Error message	Meaning	Countermeasure
The interval time must be greater that 10 seconds when using the Increment/Repetition mode.	The time value is inappropriate	Enter an appropriate time value
The maximum exposure time when using the EtBr method is 10 minutes.		
The maximum exposure time when using the UV light is 10 minutes.		
The maximum interval time is 2 hours.		
The maximum exposure time is 30 hours.		
The maximum interval time when using the EtBr method is 60 seconds.		
The maximum interval time when using the UV light is 60 seconds.		
Please input the file name using the program settings window.	No file name is given in ***Program Settings***	Input a valid filename in the ***Program Settings*** dialog
Please input a valid exposure time.	The exposure time is not appropriate	Choose a suitable exposure time
Cannot start the exposure. Automatic exposure is only available when using standard sensivity in the digitization method.	In the ***Digitize*** Method, the ***Auto*** function cannot be used when the sensitivity is ***High***, ***Super*** or ***Ultra***	Change the sensitivity setting, or expose an image in ***Manual*** mode
Automatic exposure cannot be used at the sensitivity or resolution.		

Error message	Meaning	Countermeasure
Please input a valid repeat limit count.	The number of exposures is not approriate in ***Increment*** or ***Repetition*** mode	Change the number of exposures or repeat limits to a suitable quantity
CCD Cooling is not stable. Dark frame correction will not be accurate. Do you want to continue?	CCD calibration will not be accurate since the temperature is not stable (when exposing an EtBr sample before the CCD has reached its target cooling temperature)	Click the ***OK*** button if you wish to take an exposure without correction
Can not start the exposure because the light source does not match the method. Please exchange the light source or select another method.	The incorrect light source is installed	Check that the intended light source(s) are correctly in place and that correct method is chosen
Cannot start the exposure. Flat frame calibration has not been performed. Please run flat frame calibration for the selected settings.	There is no Flat Frame file that satisfies the exposure conditions.	Create a correction file that satisfies exposure conditions using the ***Flat Frame Calibration*** function in the ***Option*** menu
Cannot start the exposure. Flat frame calibration has not been performed for digitization epi-illumination. Please run flat frame calibration for digitization epi-illumination.		
Flat frame calibration data was not found.		
Cannot start the exposure. CCD calibration has not been performed. Please run CCD calibration for the selected exposure time. Calibrate now and continue?	CCD calibration is not ready for exposure	Click the ***OK*** button to start exposure. CCD calibration for the exposure conditions is initiated.
Cannot start the exposure. CCD calibration has not been performed. Please run CCD calibration for the selected exposure time.	The CCD is not calibrated	Create a correction file that satisfies exposure conditions using the ***CCD Calibration*** function in the ***Option*** menu
Cannot start the exposure. Automatic exposure requires CCD calibration. Please run CCD calibration for the exposure time range from 1/100 sec to 2 hours.	No CCD calibration file exists.	Create a correction file using the ***CCD Calibration*** function in the ***Option*** menu. Perform calibration for both ***over 2 hours*** and ***from 1/100 sec to 2 hours***.

Error message	Meaning	Countermeasure
NP Tray can only be used in tray position 3, with the FUJINON VRF43LMD lens and the chemiluminescence method.	The NP tray can be used only with the LAS High Sens. lens and at tray position 3	Place the NP tray at tray position 3. Use the LAS High Sens. lens
NP tray is not in the proper position.		
Please set the tray so that contact is made with the sensor at the rear of the cabinet.	The tray is not detected	Insert the tray and ensure it is pushed fully in

Start button - during exposure

Error message	Meaning	Countermeasure
Cannot continue with the automatic exposure function. The sample may be out of the photometric range, or a setting may need to be adjusted.	The automatic exposure function is unable to calculate a correct exposure time	Change the settings appropriately, or perform an exposure in ***Manual*** mode
Exposure has been stopped. The UV illuminator was turned off because the 10-minute limit was reached.	The UV transilluminator was turned off	Reduce the total exposure time so that the UV transilluminator is lit for less than 10 minutes
Attention! The door was opened during exposure.	The door was opened during exposure	The image may be incorrectly exposed. Perform the exposure again.

Start button - after exposure

Error message	Meaning	Countermeasure
No image file was saved. Do you want to continue?	No images were saved	Press ***OK*** to discard the recorded image(s), or ***Cancel*** to go back and save the images
The save and launch function failed.	Failed to launch the external application. The designated file cannot be found.	Choose an application to launch in ***Launch Application*** in ***Preference*** in the ***Edit*** menu

Program settings button

Error message	Meaning	Countermeasure
Cannot save. The maximum number of registered program templates has been reached.	There are too many existing program template files	Remove some program template files that are no longer required
A program template with the same name already exists. Do you want to overwrite it?	A file with the same name already exists	Change the filename or choose to overwrite the older file
You cannot specify the first character of template name as '.' or '-'. Please start with another character.	Filename starts with an invalid character	Supply a valid file name
Please input a filename.	The filename is blank	
The wait time or exposure time of image *xx* is out of range. Please change.	The wait time or exposure time is not appropriate for the specified image	Change the wait and exposure times to appropriate values

Method/Tray Position button

Error message	Meaning	Countermeasure
Cannot identlify the light source. Please check that the light unit is installed correctly.	The light source could not be identified	Ensure that the light source is installed correctly
Cannot find the appropriate filter for the method. Please install an appropriate filter.	The appropriate filter is not in place	Make sure the correct filter for the method is in place and registered in the software

Option menu - *FlatFrame Calibration*

Error message	Meaning	Countermeasure
The door was opened during exposure. Flat frame calibration failed.	The door was opened during flat frame calibration	Close the door again and perform the flat frame calibration again
An error occurred during flat frame calibration for Cy3 tray position 4. Please check that the correct tray and calibration plate were used.	Flat Frame calibration image exposure failed	Check that the correct sample tray and calibration plate are in place and re-calibrate

Error message	Meaning	Countermeasure
Cannot start flat frame calibration because the CCD calibration for High Resolution mode does not exist. Please run CCD calibration first.	The CCD has not been calibrated	Perform a flat frame calibration

Option menu - *CCD Calibration*

Error message	Meaning	Countermeasure
The door was opened during exposure. This image may be inaccurate.	The door was opened during exposure, so the image may not have been exposed correctly	Perform the CCD calibration again

Option menu - *CCD Calibration Pro*

Error message	Meaning	Countermeasure
Cannot use the flat frame calibration for the following settings: Light none, Filter No1, FUJINON VRF43LMD lens	The ***FlatFrame Calibration Pro*** function cannot be used in chemilumescent mode	Use the ***CCD Calibration*** option
Cannot continue with the automatic exposure function. The sample may be out of the photometric range, or a setting may need to be adjusted.	The automatic exposure function is unable to calculate a correct exposure time	Change the settings appropriately, or perform an exposure in ***Manual*** mode

Help menu

Error message	Meaning	Countermeasure
Failed to open the User Manual. Please note that a PDF reader (e.g. Adobe Reader) is needed.	The PDF documents cannot be opened	Ensure that the documentation and PDF reader software is installed
Failed to open End-User Licence Agreement. Please note that a PDF reader (e.g. Adobe Reader) is needed.		
Failed to open the Getting Started guide. Please note that a PDF reader (e.g. Adobe reader) is needed.		

Edit menu - *preference - Print Adjust*

Error message	Meaning	Countermeasure
The range of % value is 90-110. Please set a suitable value within the interval.	The supplied value is not appropriate	Enter a suitable value

7 Reference information

7.1 Main specifications

CCD	3 200 000 pixels (Fujifilm super CCD)
Cooling temperature	-30°C
Number of gradations	Recorded image: 16 bit Focusing: 8 bit
Exposure time	1/100 seconds to 2 hours (Images can be continuously exposed for up to 30 hours using ImageQuant LAS 4000 Control Software.)
Lens	High-sensitivity lens F0.85 43 mm Wide view lens F1.8 24 mm
Shading correction	Software system
Maximum sample size	250 x 250 mm with F1.8 24 mm lens 210 x 140 mm with F0.85 43 mm lens
Dynamic range	4 orders of magnitude
Maximum image size	12.6 MB

Light source	Epi (class 1 light source) Blue Epi light : 460 nm Green Epi light : 520 nm Red Epi light : 630 nm NIR Epi light : 710 nm Epi and Trans (class 1M light source) UV Epi light : 365 nm UV transilluminator : 312 nm Size : 322 x 313 x 87 mm UV transmitted filter size : 200 x 200 mm White transmitted light table : White LED Size : 322 x 313 x 87 mm
External dimensions	Camera head : 224 x 161 x 252 mm (W/H/D) IDX : 510 x 730 x 480 mm (W/H/D)
Weight	Camera head : 3.4 kg IDX : 49 kg (not including the light source, lens, and tray) High-sensitivity lens : 4.5 kg

Power requirements	Input voltage : 100-240 V~ Voltage variation : +/-10% Phase : Single phase Power frequency : 50/60 Hz Rated input current : 3.0-1.5 A AC power cable Use the cable supplied with the instrument. Specifications of cables required for the use of ImageQuant LAS 4000 Voltage : 100-120 V Plug/connector : 125 V AC, 13 A Cable : SJT3 x 16AWG 60°C Power supply cord length : Maximum 3 m Voltage : 200-240 V Plug/connector : 250 V AC, 10 A Cable : CENELEC OC 3 x 1.0 mm^2 70°C Power supply cord length : Maximum 3 m

Installation conditions	Placement conditions Free space required around ImageQuant LAS 4000 Secure space for maintenance work as follows: Front : 600 mm Right : 600 mm Left : 600 mm Rear : 200 mm Top : 1000 mm Table strength The allowable load must be 981 N/m^2 (100kg/m^2) or greater. Other conditions 1 Decide on an installation location taking into consideration the work flow and ancillary facilities to be used. 2 Required construction work and electricity/air conditioning work must be completed in advance. 3 It is not desirable to have a heat source on the IDX right side face where there is an air intake fan even if the environmental requirements have been met. 4 Do not install the equipment near a window to avoid direct sunlight. Attach a blind to nearby windows. 5 Do not place objects near the power outlet so that you can disconnect the power cable from the outlet in case of emergency. Floor oscillation conditions (1) Operating time Oscillation : 0.03G (5 to 60 Hz) Impact : 1G (2) Non-operating time Oscillation : 0.4G (5 to 60 Hz) Impact : 2G

	Environmental conditions Operating temperature/humidity conditions Temperature :15°C to 28°C (with temperature fluctuation below 10°C per hour or lower) Humidity :30 % to 70 % RH (no dew condensation) When the above conditions cannot be satisfied, modify the facilities accordingly. Transportation/storage conditions Temperature : -25°C to 70°C Humidity : 5 % to 100 % RH (no dew condensation) Installation location conditions 1 Do not install the equipment in an area where the temperature varies widely. 2 Do not install the equipment near a source of heat. 3 Do not install the equipment in an area where it may get wet or flooded. 4 Do not install the equipment in an area where it may be exposed to corrosive gas. 5 Do not install the equipment in a dusty area. 6 Do not install the equipment in an area constantly or excessively exposed to oscillations or impacts. 7 Do not install the equipment in an area exposed to direct sunlight. Operation site : Indoors Maximum operating altitude : 2000 m or lower Overvoltage category category II : Transient overvoltage Rated pollution applied : Pollution Degree 2
Analysis unit interface	USB 2.0 Do not connect the ImageQuant LAS 4000 USB connector to a computer not certified with UL60950-1 (UL listed) and IEC60950-1.
Others	Noise : 70 dB (A) or lower

7.2 Minimum computer requirements

Operating system	Windows™ XP™ SP3 or Windows Vista™ Business SP1 (32-bit)
Memory	More than 1 GB
Processor	Intel Core 2 Duo processor
HD	More than 80 GB
USB port version	USB 2.0
Optical drives	DVD-ROM
Monitor resolution	More than 1280 × 1024 pixels

7.3 Literature

For further information on the ImageQuant LAS 4000 and the ImageQuant LAS 4000 Control Software, refer to the ImageQuant LAS 4000 User Manual.

7.4 Ordering information

For ordering information visit www.gelifesciences.com/quantitative_imaging.

For local office contact information, visit
www.gelifesciences.com/contact

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